SS-S/Q/C

Step-Servo Drive

Hardware Manual

SHANGHAI AMP & MOONS' AUTOMATION CO.,LTD.

Rev. 1.1
0004102014

Contents

1 Introduction 4
1.1 Features 4
1.2 Block Diagram 5
1.3 Safety Instructions 7
2 Getting Started 8
2.1 Installing Software 8
2.2 Connecting to the PC using RS-232 10
2.3 Connecting to a Host using RS-485 10
2.3.1 RS-485 Four-wire Configuration 11
2.3.2 RS-485 Tow-wire Configuration 11
2.4 Connecting to a host using CANopen 11
2.5 Connecting the Power Supply 12
2.6 Choosing A Power Supply 12
2.6.1 Voltage 12
2.6.2 Current 13
2.7 Connect to Motor 23
3 Inputs and Outputs 24
3.1 Digital Inputs 25
3.1.1 X1/STEP and X2/DIR High Speed Digital Inputs 25
3.1.2 X3/CW LIMIT and X4/CCW LIMIT High-speed Digital Inputs 26
3.1.3 X5/EN, X6/AR,X7 and X8 Digital Inputs 27
3.2 Digital Outputs 28
3.2.1 Y1/ALARM,Y2/IN POSITION,Y3 and Y4 Digital Outputs 28
3.3 Analog Inputs 29
4 Mounting the Drive 30
5 LED Display 30
5.1 Operation Mode 30
5.2 Alarm Error Code 31
5.3 Assigning RS-485 Address 32
5.4 RS-485 Baud Rate and Terminating Resistor 33
5.5 Assigning CANopen Address 33
5.6 CANopen Baud Rate and Terminating Resistor 33
6 Reference Materials 34
6.1 Drive Mechanical Outlines 34
6.2 Technical Specifications 35

6.3 Recommended Motor 36
6.4 Motor Outlines 37
6.5 Torque Curves 39
6.6 Motor Numbering System 41
6.7 Drive Numbering System 41
7 Optional Accessories (Sold separately).....42
8 Contacting MOONS' 44

This User Manual is only applicable to the following models.

Models	Communications		
	RS-232	RS-485	CANopen
SS03-S-A	✓		
SS05-S-A	✓		
SS10-S-A	✓		
SS03-S-R	✓	✓	
SS05-S-R	✓	✓	
SS10-S-R	✓	✓	
SS03-Q-A	✓		
SS05-Q-A	✓		
SS10-Q-A	✓		
SS03-Q-R	✓	✓	
SS05-Q-R	✓	✓	
SS10-Q-R	✓	✓	
SS03-C-C	✓		✓
SS05-C-C	✓		✓
SS10-C-C	✓		✓

1 Introduction

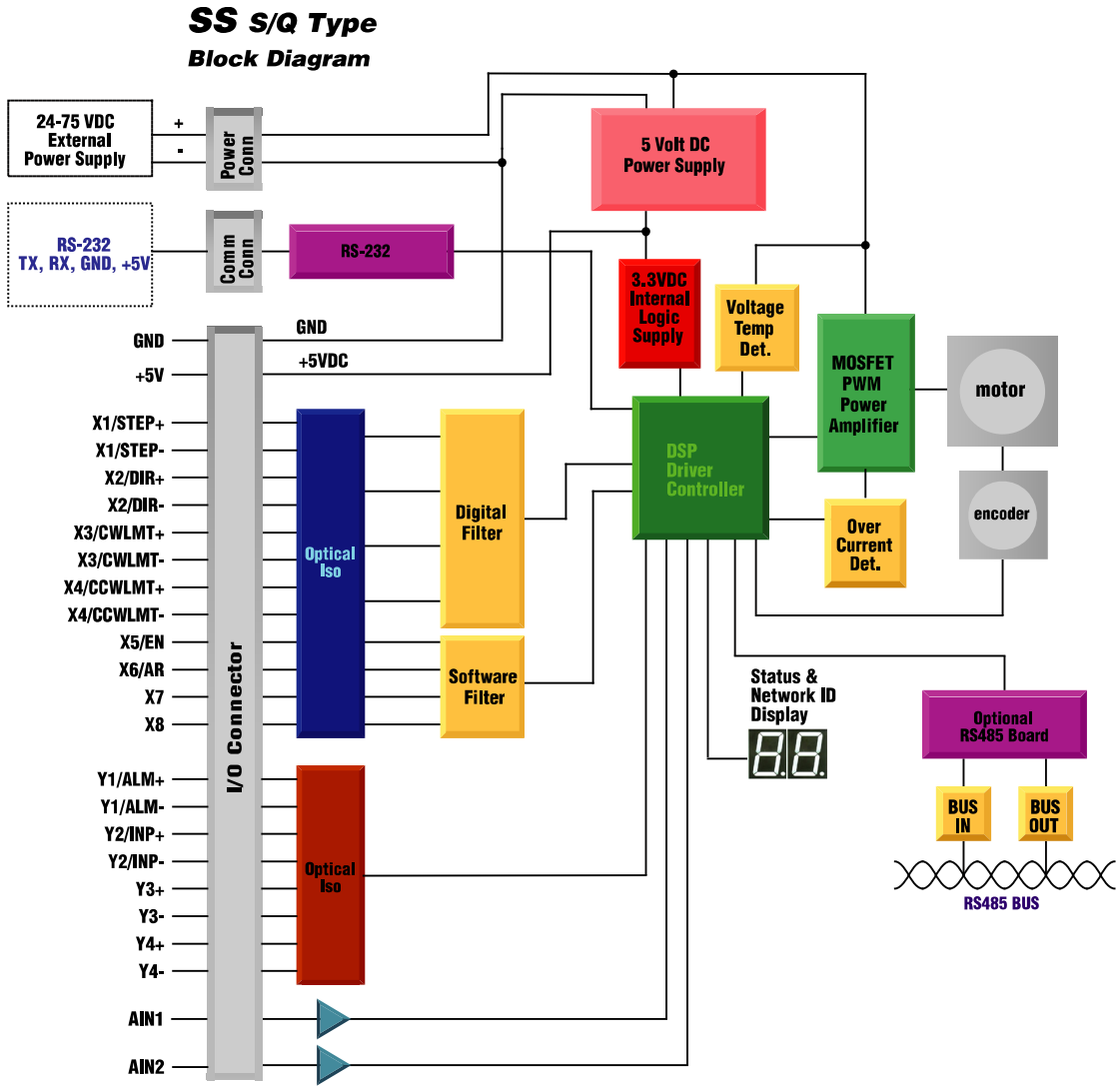
Thank you for selecting the MOONS' SS series Step-Servo drive and motor. SS series combines servo technology with an stepper motor to create a product with exceptional feature an broad capability.

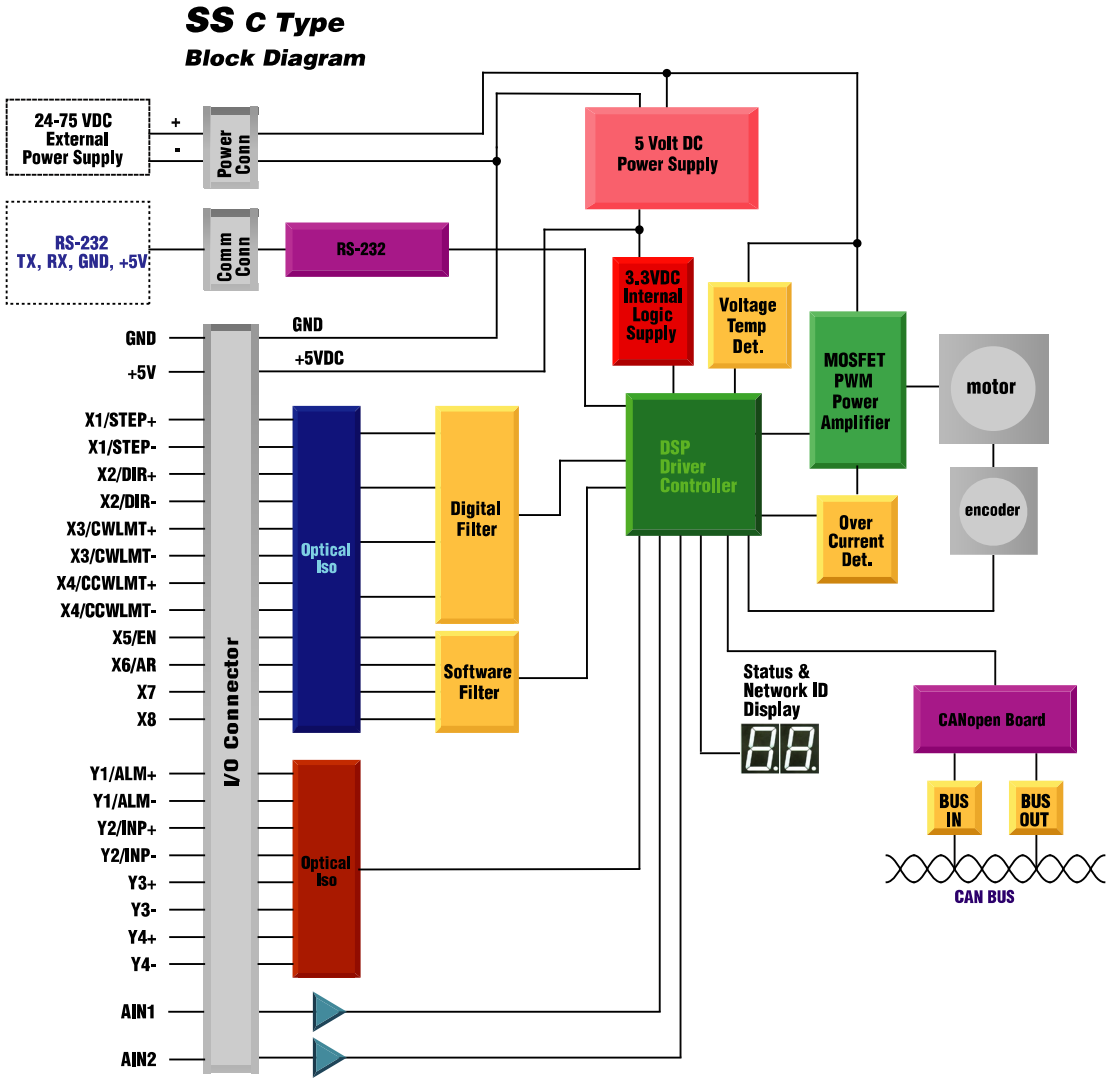
1.1 Features

- Programmable, digital step-servo drive and motor package
- Operates from a 24 to 75 volt DC power supply
- Control modes:
  - Torque Control
    - * Analog input
    - * SCL command
  - Velocity Control
    - * Digital input Control Velocity
    - * Analog velocity
    - * SCL command Velocity
  - Position Control
    - * Digital Input
      - Pulse & Direction
      - CW/CCW Pulse
      - A/B quadrature(Encoder following)
    - * Analog Control
    - * SCL command
  - Q programming(-Q or -C model)
    - * Stand alone operation
  - CANopen (-C model only)
- Compliant with CiA301 and CiA402
- RS-232 serial communication
- Optional RS-422/485 communication
- Encoder resolution: 20000 counts/rev for AM17/23/24/34SS motor
- 4096 counts/rev for AM11SS motor
- SS03 output current: continuous 3A, boost 4.5A
- SS05 output current: continuous 5A, boost 7.5A
- SS10 output current: continuous 10A, boost 15A
- 8 optically isolated digital inputs,5-24VDC
- 4 optically isolated digital outputs,max30V/100mA
- 2 analog inpus, can be configured to 0-5V, 0-10V, ±5V or ±10V signal ranges.
- Technological advance

  Full servo control, Closed loop,
  Efficient, Accurate, Fast, Smooth
  Intelligent, Compact

1.2 Block Diagram




SS C Type
Block Diagram
24-75 VDC External Power Supply
+
-
Power Conn
5 Volt DC Power Supply
RS-232 TX, RX, GND, +5V
Comm Conn
RS-232
3.3VDC Internal Logic Supply
Voltage Temp Det.
MOSFET PWM Power Amplifier
motor
encoder
GND
+5V
GND
+5VDC
X1/STEP+
X1/STEP-
X2/DIR+
X2/DIR-
X3/CWLMT+
X3/CWLMT-
X4/CCWLMT+
X4/CCWLMT-
X5/EN
X6/AR
X7
X8
Optical Iso
Digital Filter
Software Filter
DSP Driver Controller
Over Current Det.
I/O Connector
Status & Network ID Display
CANopen Board
BUS IN
BUS OUT
CAN BUS
Y1/ALM+
Y1/ALM-
Y2/INP+
Y2/INP-
Y3+
Y3-
Y4+
Y4-
Optical Iso
AIN1
AIN2

1.3 Safety Instructions

Only qualified personnel should transport, assemble, install, operate, or maintain this equipment. Properly qualified personnel are persons who are familiar with the transport, assembly, installation, operation, and maintenance of motors, and who meet the appropriate qualifications for their jobs.

To minimize the risk of potential safety problems, all applicable local and national codes regulating the installation and operation of equipment should be followed. These codes may vary from area to area and it is the responsibility of the operating personnel to determine which codes should be followed, and to verify that the equipment, installation, and operation are in compliance with the latest revision of these codes.

Equipment damage or serious injury to personnel can result from the failure to follow all applicable codes and standards. MOONS' does not guarantee the products described in this publication are suitable for a particular application, nor do they assume any responsibility for product design, installation, or operation.

- Read all available documentation before assembly and operation. Incorrect handling of the products referenced in this manual can result in injury and damage to persons and machinery. All technical information concerning the installation requirements must be strictly adhered to.

- It is vital to ensure that all system components are connected to earth ground. Electrical safety is impossible without a low-resistance earth connection.

- This product contains electrostatically sensitive components that can be damaged by incorrect handling. Follow qualified anti-static procedures before touching the product.

- During operation keep all covers and cabinet doors shut to avoid any hazards that could possibly cause severe damage to the product or personal health.

- During operation, the product may have components that are live or have hot surfaces.

- Never plug in or unplug the Integrated Motor while the system is live. The possibility of electric arcing can cause damage.

Be alert to the potential for personal injury. Follow recommended precautions and safe operating practices emphasized with alert symbols. Safety notices in this manual provide important information. Read and be familiar with these instructions before attempting installation, operation, or maintenance. The purpose of this section is to alert users to the possible safety hazards associated with this equipment and the precautions necessary to reduce the risk of personal injury and damage to equipment. Failure to observe these precautions could result in serious bodily injury, damage to the equipment, or operational difficulty.

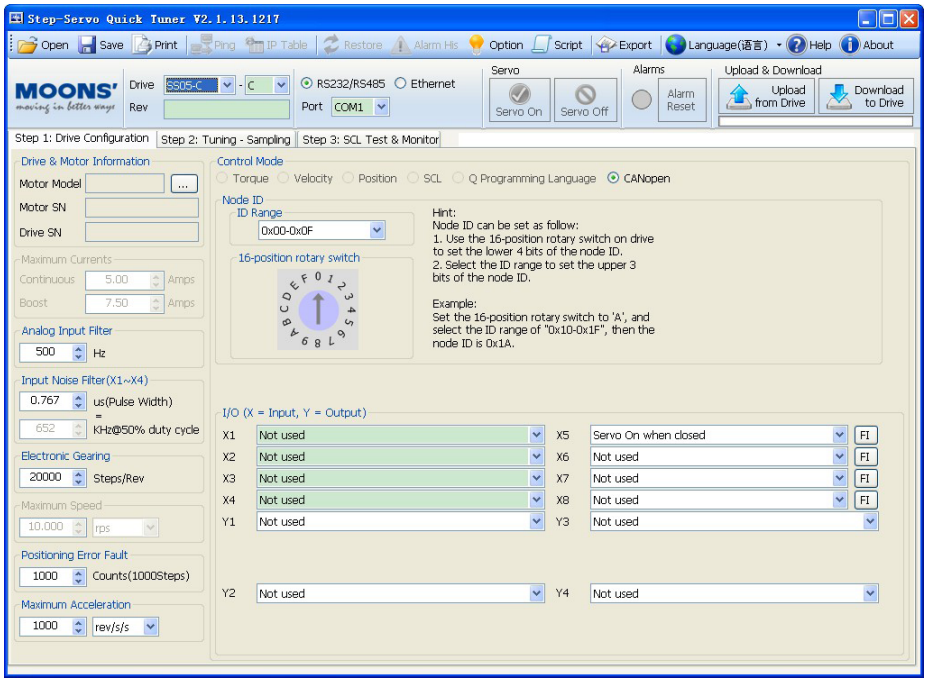
2 Getting Started

The following items are needed:

- A 24-75 Volt DC power supply, see the section below entitled “Choose a Power Supply” for help in choosing the right one.
- A compatible SS motor, please see the section below entitled “Recommended Motor”
- A small flat blade screwdriver for tightening the connectors screw(included)
- A PC running Microsoft Windows XP/Vista/Windows7(Using serial communication port. Need a USB to Serial converter if the PC doesn’t have.)
- A RS-232 communication cable(included)
- Require CAT5 cable for RS-485 or CANopen daisy chain connection.

2.1 Installing Software

Step-Servo Quick Tuner is the PC based software application used to configure, and perform servo tuning, drive testing and evaluation of the step-servo products. System servo control gains, drive functionality and I/O configuration are set with Step-Servo Quick Tuner. It also contains an oscilloscope function to help set the servo control gains.

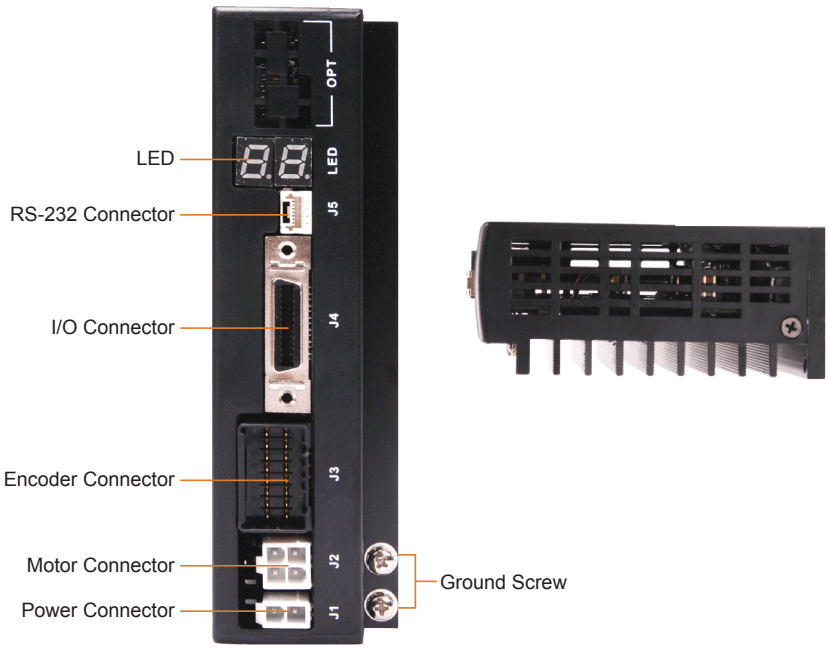


- Download the Step-Servo Quick Tuner from the MOONS’ website and install it.
- Launch the software by clicking Start-----Programs ----MOONS’
- Connect the drive to PC by RS-232 cable. Please select right COM port in the software.
- Connect the drive to the Power Supply.
- Connect the motor to the drive.
- Power up the drive.
- The software will recognize your drive, display the model and firmware version and be ready for action.

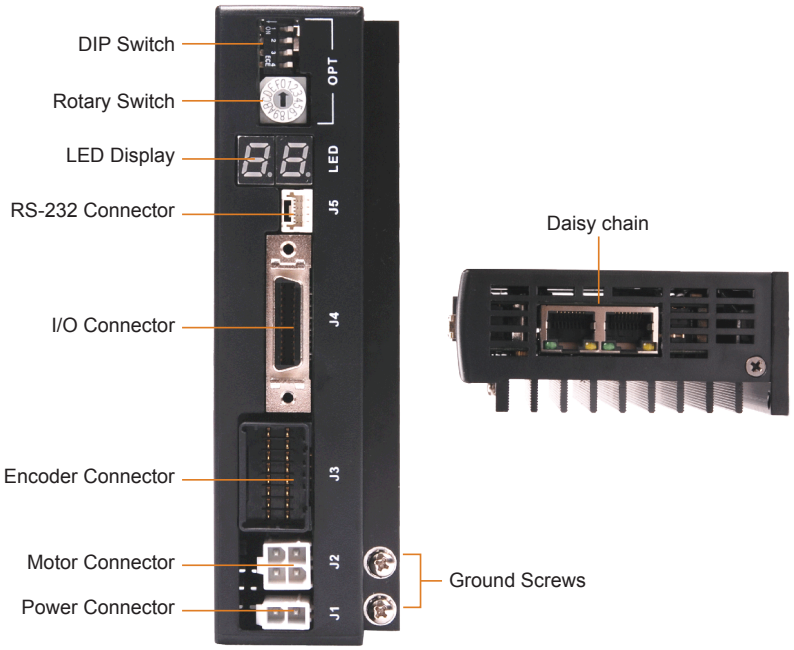
For -Q drive, download and install Q Programmer software.

For -C drive, if want to use the Q program,it also need to download and install Q Programmer software.

The connectors and other points of interest are illustrated below:



Model		
SS03-S-A	SS05-S-A	SS10-S-A
SS03-Q-A	SS05-Q-A	SS10-Q-A



Model		
SS03-S-R	SS05-S-R	SS10-S-R
SS03-Q-R	SS05-Q-R	SS10-Q-R
SS03-C-C	SS05-C-C	SS10-C-C

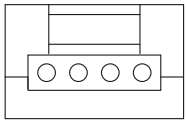
2.2 Connecting to the PC using RS-232

The SS drives are shipped with a 1.5 meters RS-232 communication cable. The DB9 connector is used to connect to PC. The small end is a crimping connector used to connect to the drive.

Located the SS drive within 1.5 meters of the PC. Plug the DB9 connector into the serial COM port of the PC. Plug the small end crimping connector into the RS-232 port of the drive. Do not hot plug.

If the PC doesn't have a RS-232 serial port, a USB to RS232 converter will be needed.

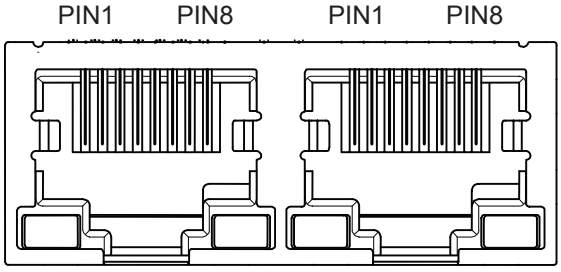
You can contact MOONS' to buy a USB to RS-232 converter..



RS-232 Connector Diagram

2.3 Connecting to a Host using RS-485

The RS-485 version SS drives can be daisy-chain connected through the dual-port RJ45 connectors at the side of the drive, using CAT5 cable.



RJ45 Connector Diagram

PIN	Function
1	RX+
2	RX-
3	TX+
6	TX-
4,5,7,8	GND

2.3.1 RS-485 Four-wire Configuration

RS-485 four-wire system utilize separate transmit and receive wires. One pair of wires connect the host's transmit signals(TX+/TX-) to each drive's RX+/RX- receive terminals. The other pair connects the drive's TX+/TX- terminals to the host's receive signals. A logical ground terminal is provided on each drive and can be used to keep all the drives at the same ground potential. The first drive's logical GND of the RS-485 bus must connect to host's ground.

Four-wire Connection

Connect the drive's RX+ to the TX+ terminal of the host controller,and connect the drive's RX- to the TX- terminal of the host controller .

Connect the drive's TX+ to the RX+ terminal of the host controller,and connect the drive's TX- to the RX- terminal of the host controller .

Connect the drive's GND and the host's GND to a same ground.

2.3.2 RS-485 Tow-wire Configuration

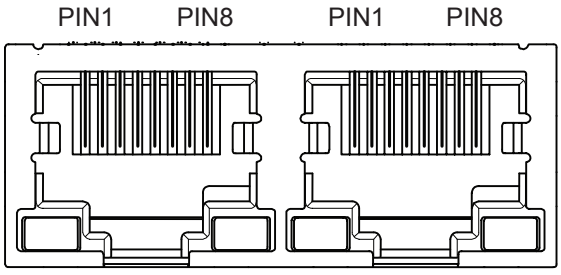
In a two-wire system ,the data transmitting and receiving use a same cable.,the host must stop its transmitting before receiving data. That means the host must stop transmit data before drive begins to answer a query which just come from the host, otherwise the host cannot receive any data witch sent from a drive. There is a transmit delay parameter that can be adjusted to compensate for a host that is slow to disable its transmitter. This adjustment can be set over the network using the TD command,it also can be set by using the Step-Servo Quick Tuner software. Users can set a shorter transmit delay in a four-wire system.

Two-wire connection

The RX+ and TX+ of the drive connect to the host's D+ in parallel.
The RX- and TX- of the drive connect to the host's D- in parallel.
Connect the drive's GND and the host's GND to a same ground.

2.4 Connecting to a host using CANopen

The CANopen version SS drives can be daisy-chain connected through the dual-port RJ45 connectors at the side of the drive, using CAT5 cable.



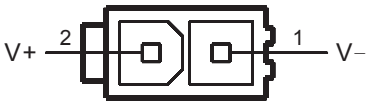
RJ45 Connector Diagram:

PIN	Function
1	CAN_H
2	CAN_L
3,7	GND
6	CHGND
4,5,8	NC

2.5 Connecting the Power Supply

The SS drives are shipped with a power cable, 2 meters long. Connect the red wire to the positive of the power supply. Connect the black wire to the negative of the power supply. Plug the cable into the power connector of the drive.

The red wire is connected to the V+ of the drive. The black wire is connected to the V- of the drive. Do not reverse them. Connect the chassis to the earth ground through the grounding screws.



Power Connector

The section below entitled “Choosing a Power Supply” will help you to select a right power supply.

2.6 Choosing A Power Supply

The main considerations when choosing a power supply are the voltage and current requirements of the application.

2.6.1 Voltage

The SS step-servo drive and motor is designed to give optimum performance between 24~48 Volts DC. Choosing the voltage depends on the performance needed and diver/motor heating that acceptable and/or does not cause a drive over-temperature. Higher voltage will give higher speed performance,but will cause the drive to produce higher temperatures. Using power supplies with voltage outputs that are near the drive maximum may significantly reduce the operational duty-cycle.

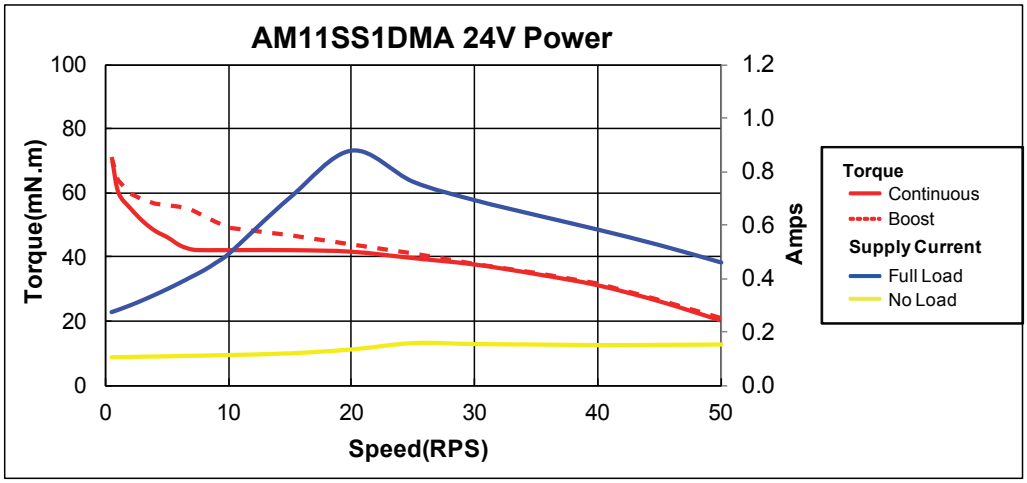
The SS extended range of operation can be as low as 18VDC minimum to as high as 80VDC maximum. When operation below 18VDC, the SS series will work unstable. The supply input cannot go blow 18VDC for reliable operation, otherwise under voltage alarm will be triggered. SS drive will stop working when this alarm is triggered.

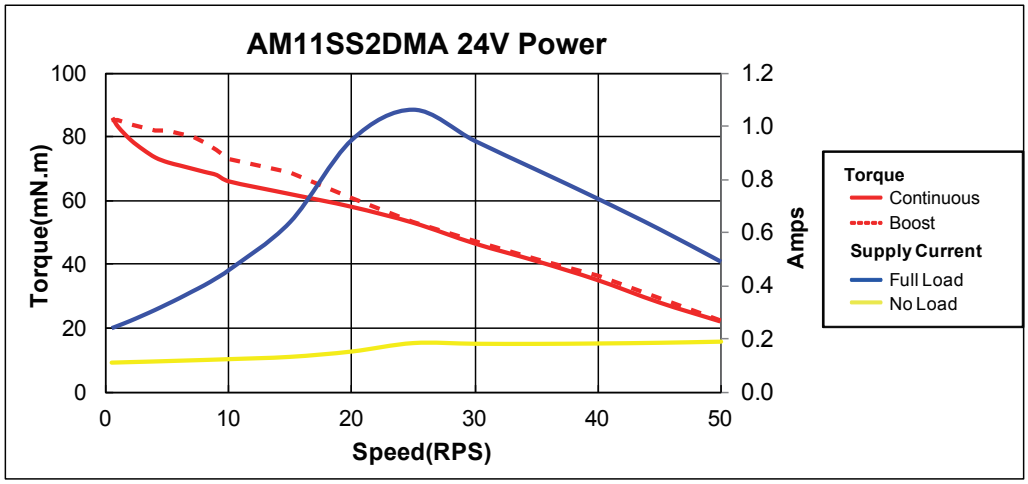
If a regulated power supply is used,and that is near the driver maximum voltage of 80VDC ,a voltage clamp may be required to prevent the voltage over 80VDC which will occurs a over-voltage fault. When using an unregulated power supply, make sure the no-load voltage of the supply does not exceed the maximum input voltage 80VDC.

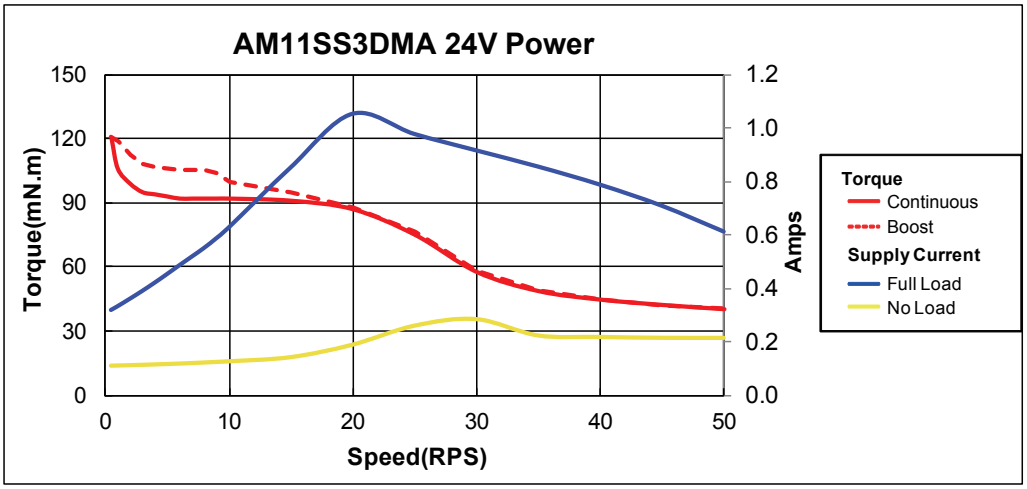
2.6.2 Current

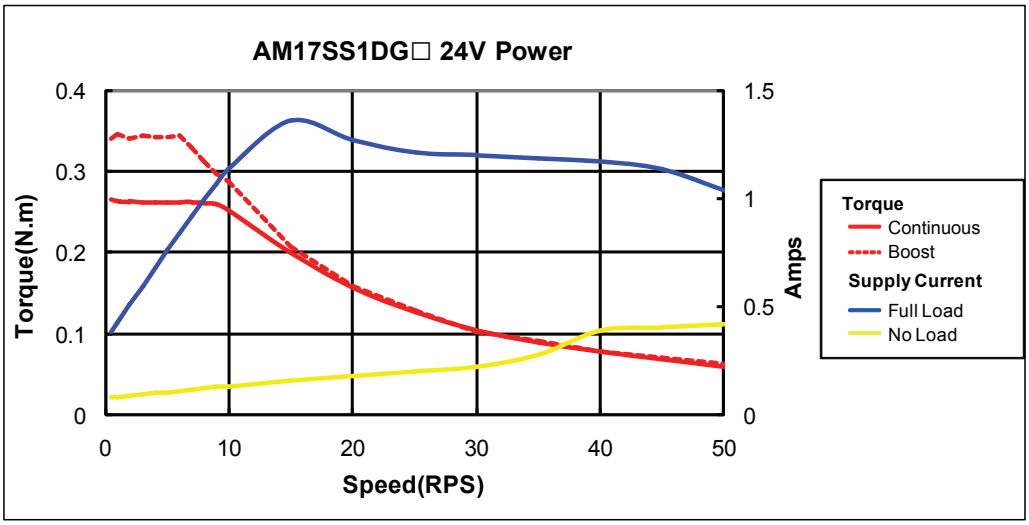
The maximum supply currents required by the SS series step servo drive and motor are shown below in chats at different power supply voltage input. The SS drive power supply current is lower than the the winding currents because it uses switching amplifiers to convert a high voltage and low current into low voltage and high current. The more power supply voltage exceeds the motor voltage,the less current will be required from the power supply.

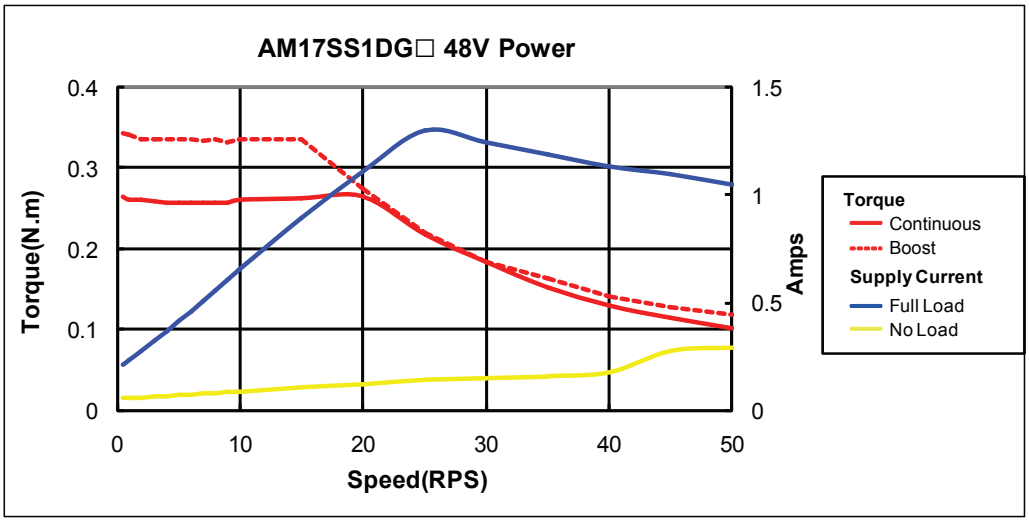
It is important to note that the current draw is significantly different at higher speeds depending on the torque load to the motor. Estimating how much current is necessary may require a good analysis of the load to the motor.

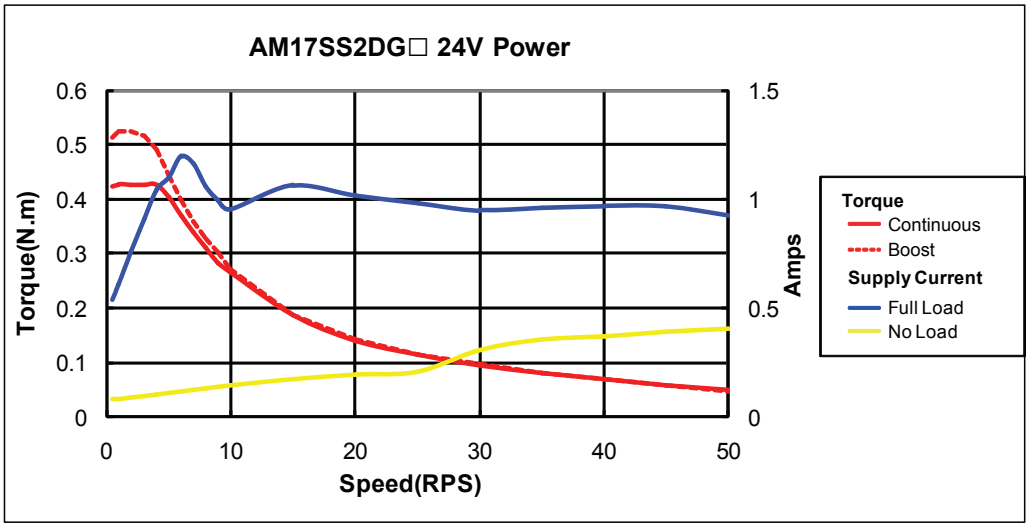


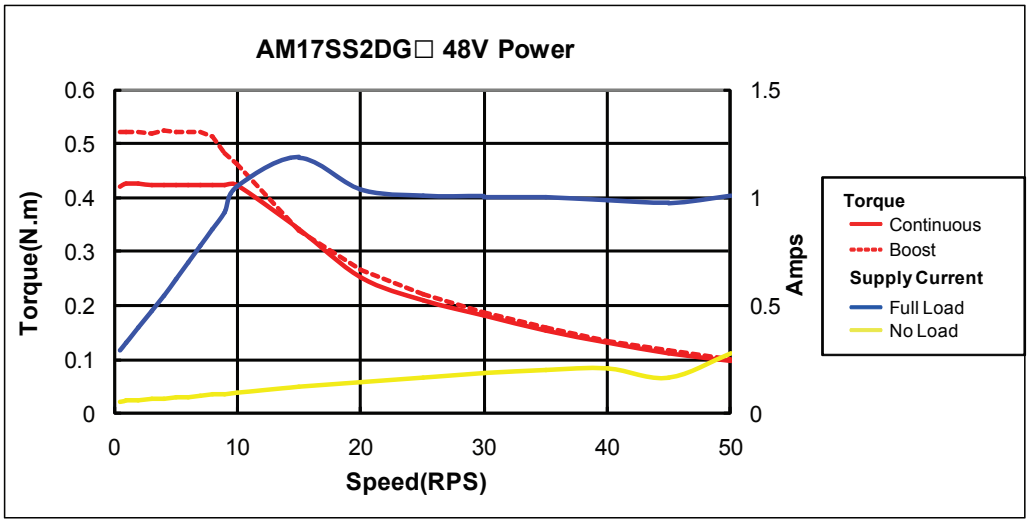


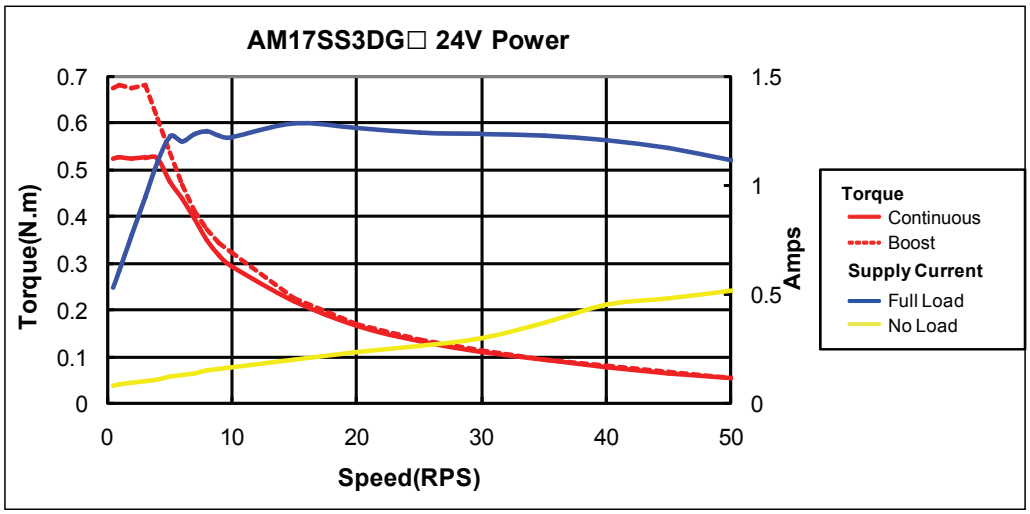

AM11SS3DMA 24V Power
Torque(mN.m)
150
120
90
60
30
0
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Amps
0
10
20
30
40
50
Speed(RPS)
Torque
Continuous
Boost
Supply Current
Full Load
No Load

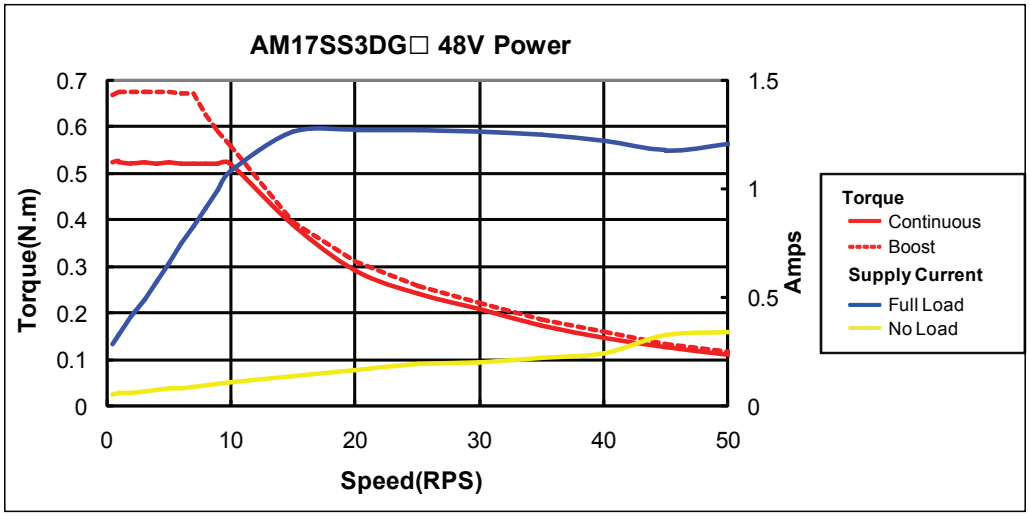

AM17SS1DG□ 24V Power
Torque(N.m)
0.4
0.3
0.2
0.1
0
1.5
1
0.5
0
Amps
0
10
20
30
40
50
Speed(RPS)
Torque
Continuous
Boost
Supply Current
Full Load
No Load

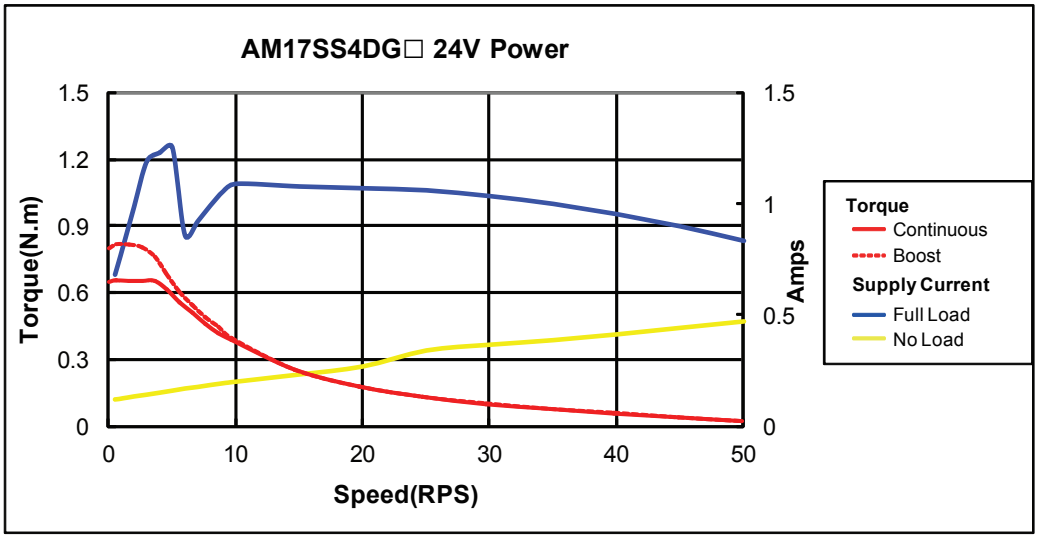

AM17SS1DG□ 48V Power
Torque(N.m)
0.4
0.3
0.2
0.1
0
1.5
1
0.5
0
Amps
0
10
20
30
40
50
Speed(RPS)
Torque
Continuous
Boost
Supply Current
Full Load
No Load

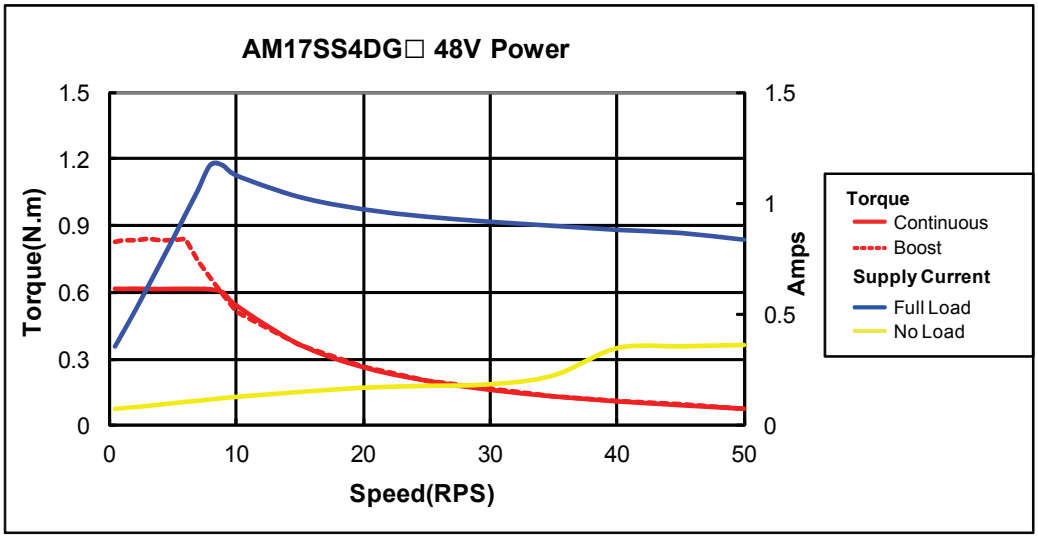

AM17SS2DG□ 24V Power
Torque(N.m)
0.6
0.5
0.4
0.3
0.2
0.1
0
1.5
1
0.5
0
Amps
0
10
20
30
40
50
Speed(RPS)
Torque
Continuous
Boost
Supply Current
Full Load
No Load

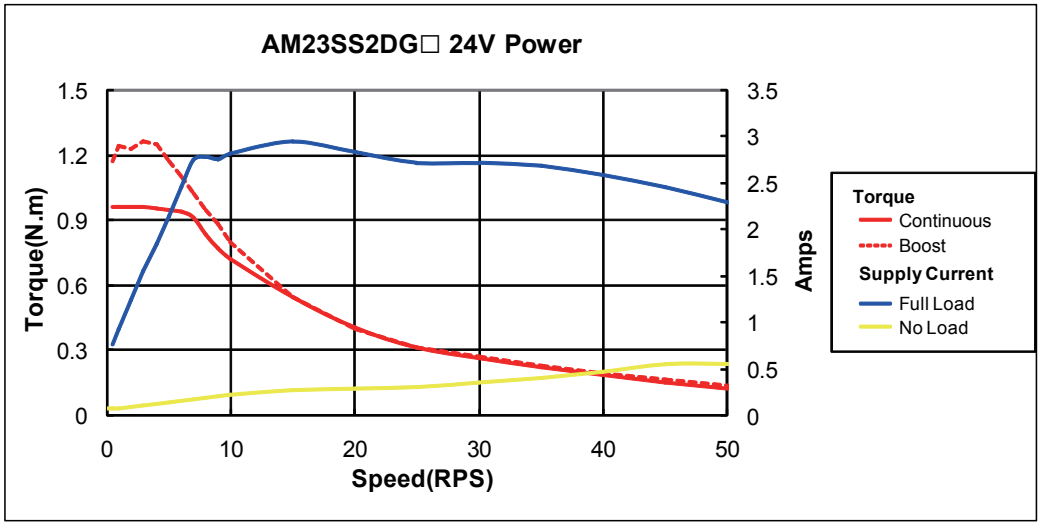

AM17SS2DG□ 48V Power
Torque(N.m)
0.6
0.5
0.4
0.3
0.2
0.1
0
1.5
1
0.5
0
Amps
0
10
20
30
40
50
Speed(RPS)
Torque
Continuous
Boost
Supply Current
Full Load
No Load

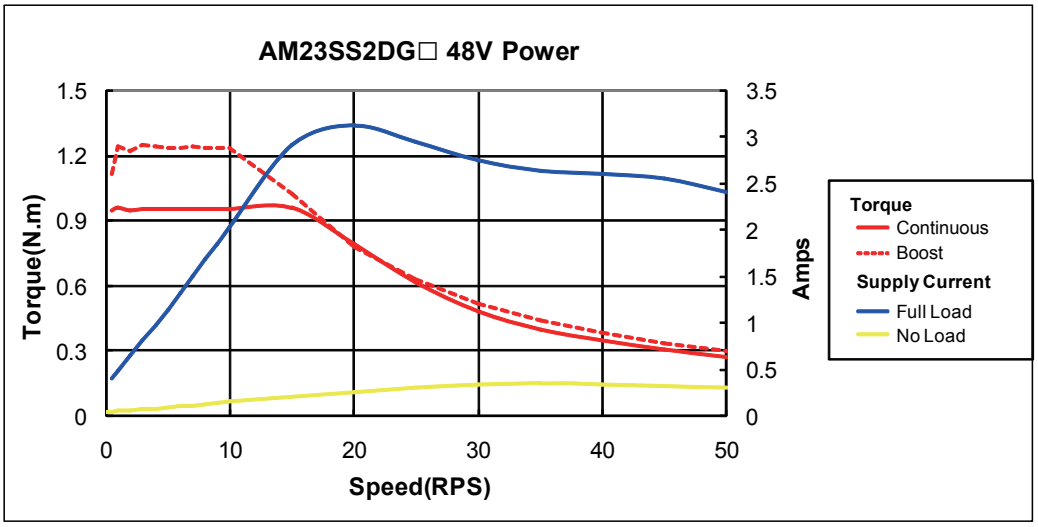

AM17SS3DG□ 24V Power
Torque(N.m)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1.5
1
0.5
0
Amps
0
10
20
30
40
50
Speed(RPS)
Torque
Continuous
Boost
Supply Current
Full Load
No Load

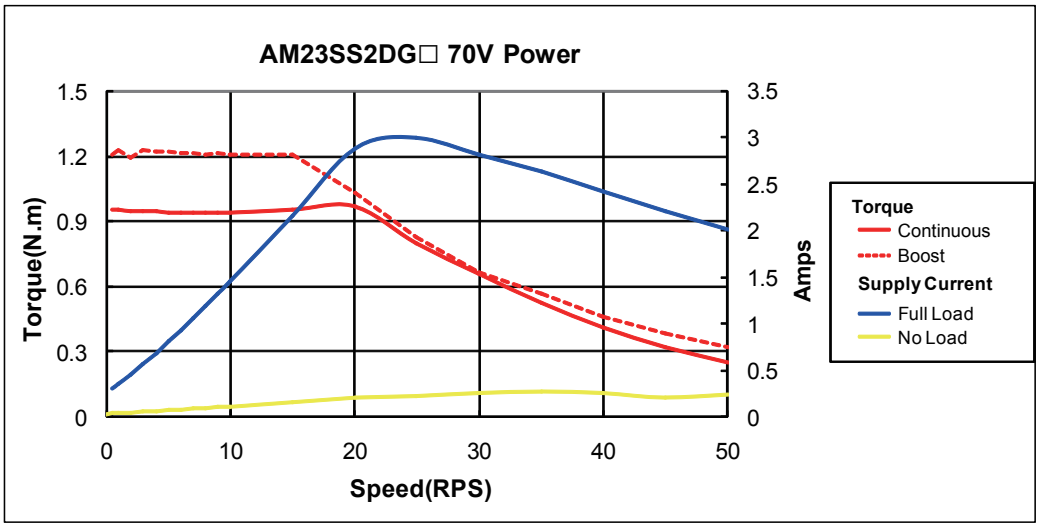

AM17SS3DG□ 48V Power
Torque(N.m)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1.5
1
0.5
0
Amps
0
10
20
30
40
50
Speed(RPS)
Torque
Continuous
Boost
Supply Current
Full Load
No Load

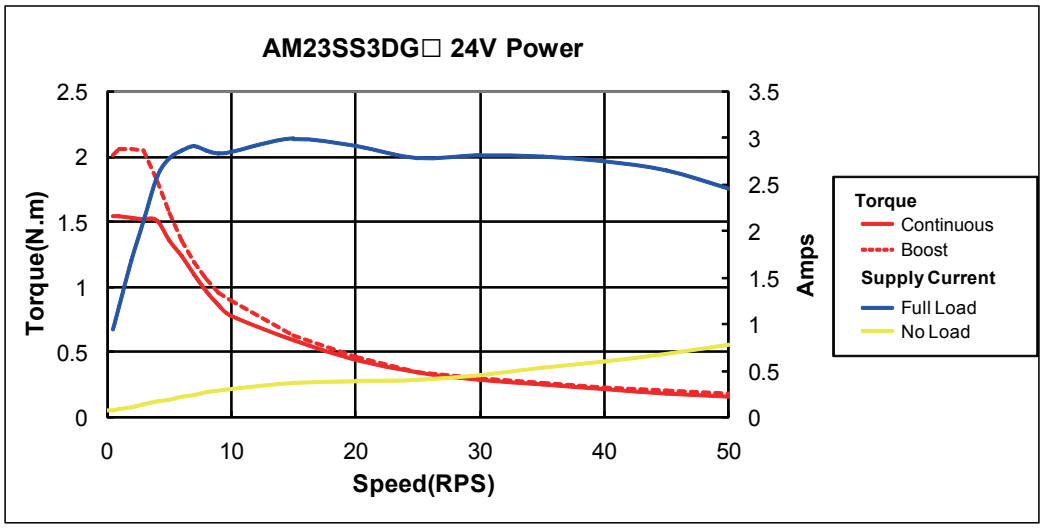

AM17SS4DG□ 24V Power
Torque(N.m)
1.5
1.2
0.9
0.6
0.3
0
1.5
1
0.5
0
Amps
0
10
20
30
40
50
Speed(RPS)
Torque
Continuous
Boost
Supply Current
Full Load
No Load

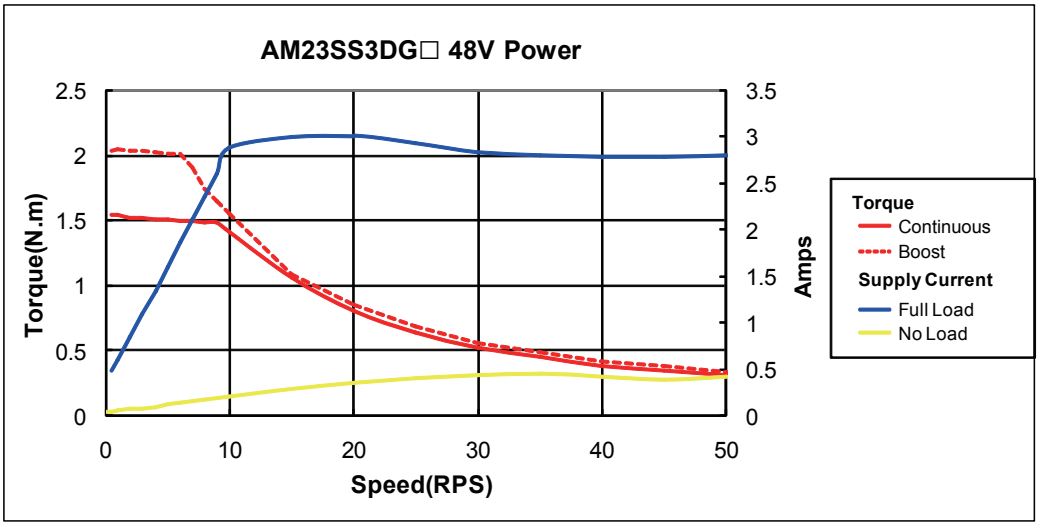

AM17SS4DG□ 48V Power
Torque(N.m)
1.5
1.2
0.9
0.6
0.3
0
1.5
1
0.5
0
Amps
0
10
20
30
40
50
Speed(RPS)
Torque
Continuous
Boost
Supply Current
Full Load
No Load

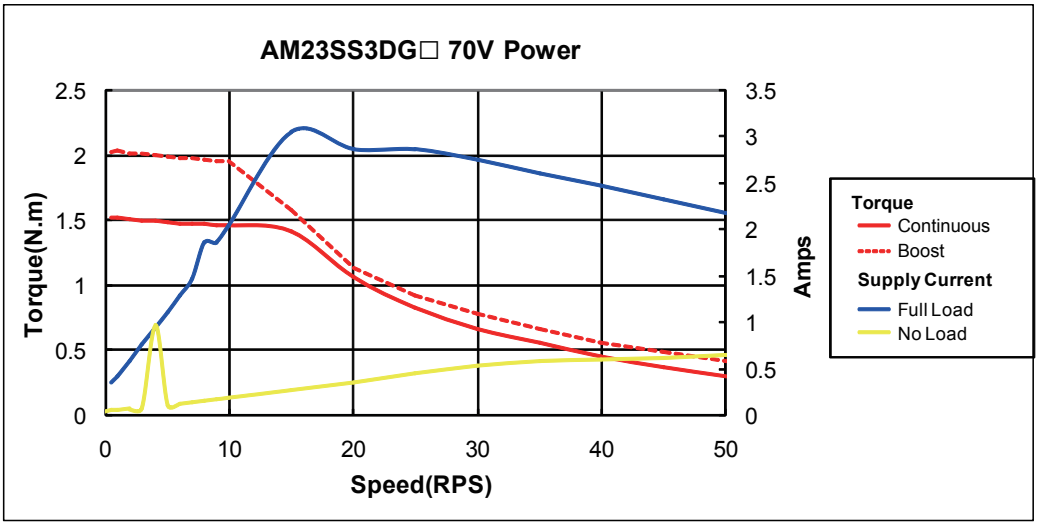

AM23SS2DG□ 24V Power
Torque(N.m)
Amps
Speed(RPS)
Torque
Continuous
Boost
Supply Current
Full Load
No Load

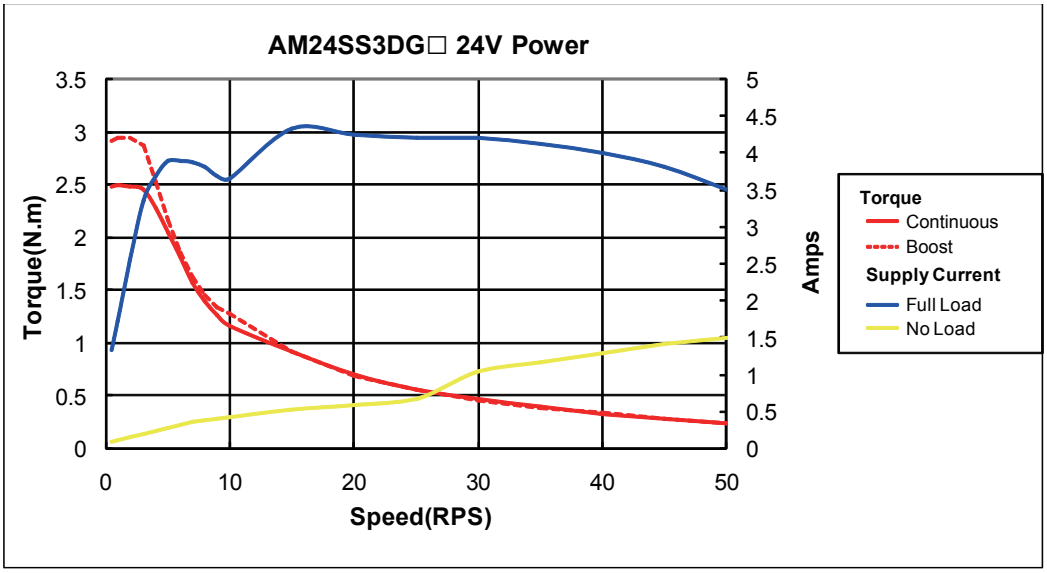

AM23SS2DG□ 48V Power
Torque(N.m)
Amps
Speed(RPS)
Torque
Continuous
Boost
Supply Current
Full Load
No Load

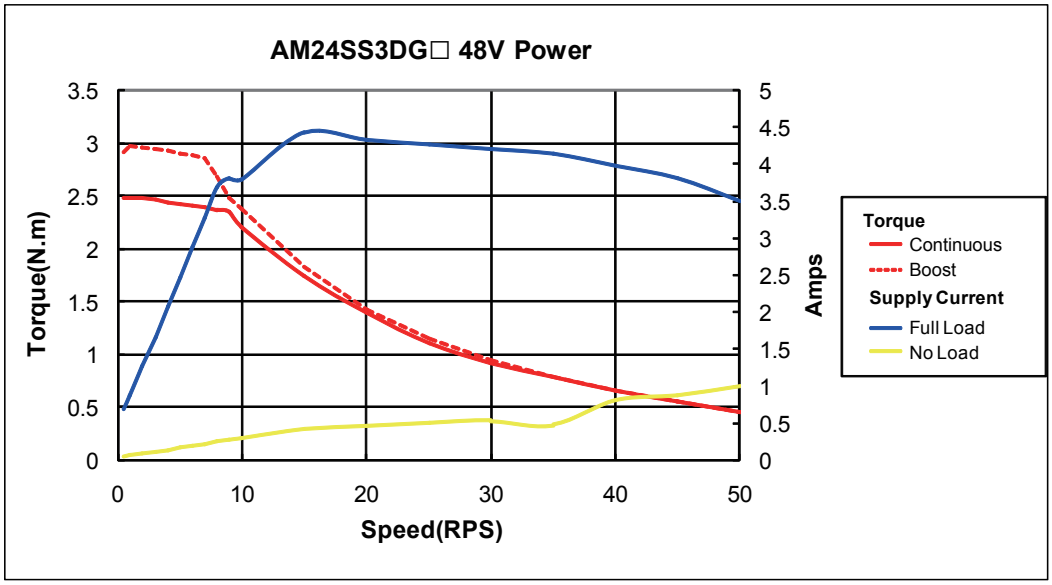

AM23SS2DG□ 70V Power
Torque(N.m)
Amps
Speed(RPS)
Torque
Continuous
Boost
Supply Current
Full Load
No Load

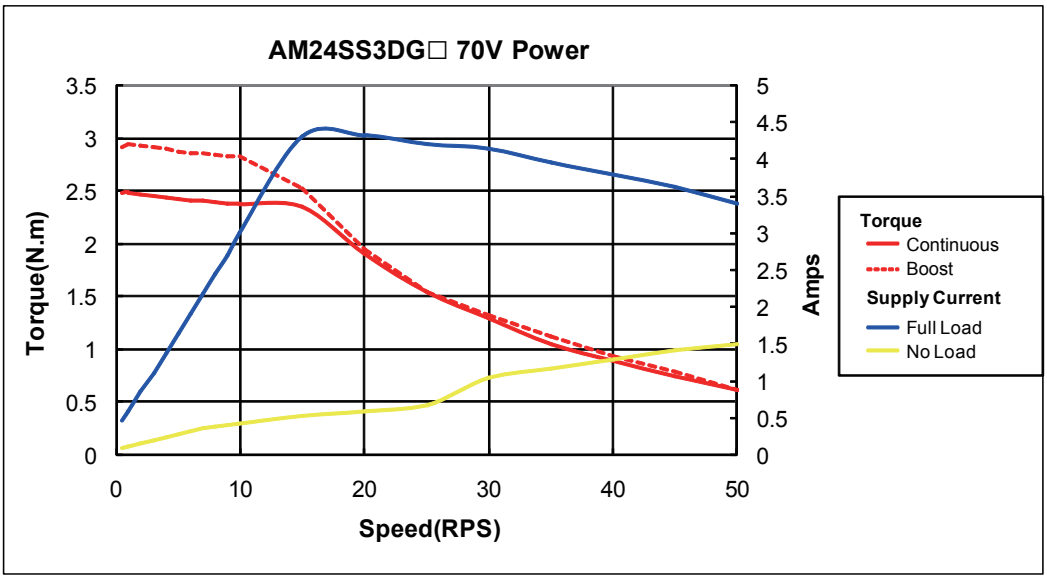

AM23SS3DG□ 24V Power
Torque(N.m)
Amps
Speed(RPS)
0
0.5
1
1.5
2
2.5
3
3.5
0
10
20
30
40
50
Torque
Continuous
Boost
Supply Current
Full Load
No Load

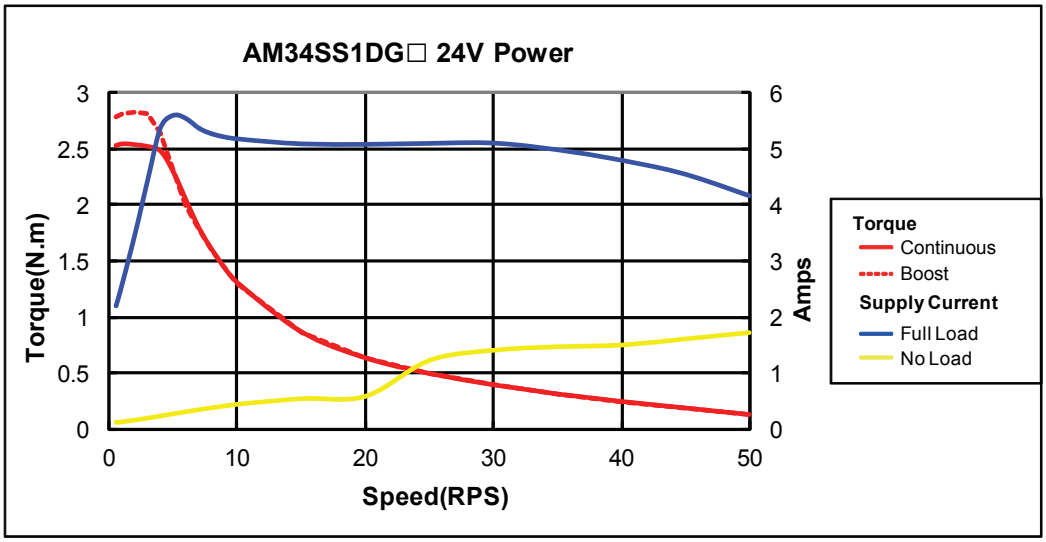

AM23SS3DG□ 48V Power
Torque(N.m)
Amps
Speed(RPS)
0
0.5
1
1.5
2
2.5
3
3.5
0
10
20
30
40
50
Torque
Continuous
Boost
Supply Current
Full Load
No Load

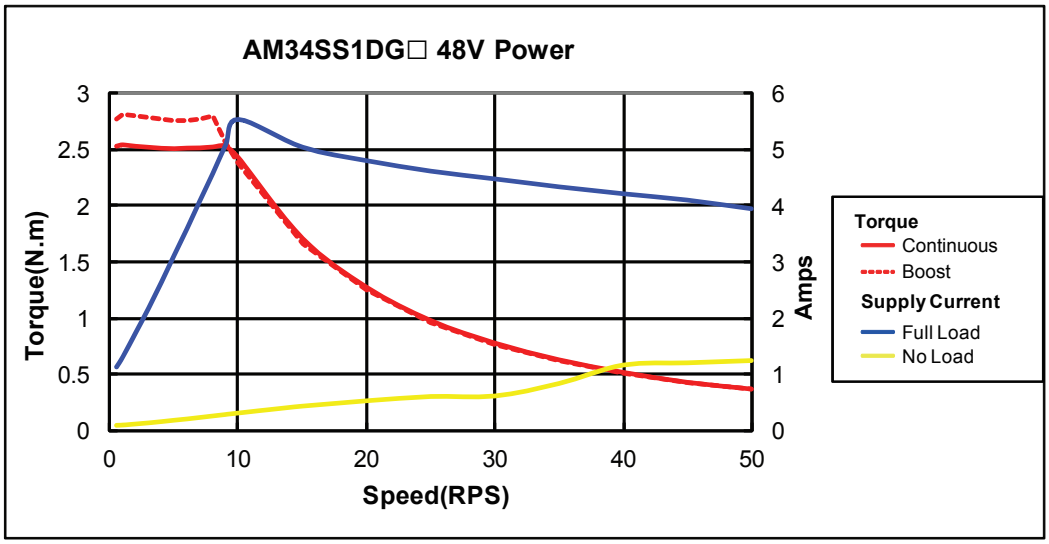

AM23SS3DG□ 70V Power
Torque(N.m)
Amps
Speed(RPS)
0
0.5
1
1.5
2
2.5
3
3.5
0
10
20
30
40
50
Torque
Continuous
Boost
Supply Current
Full Load
No Load

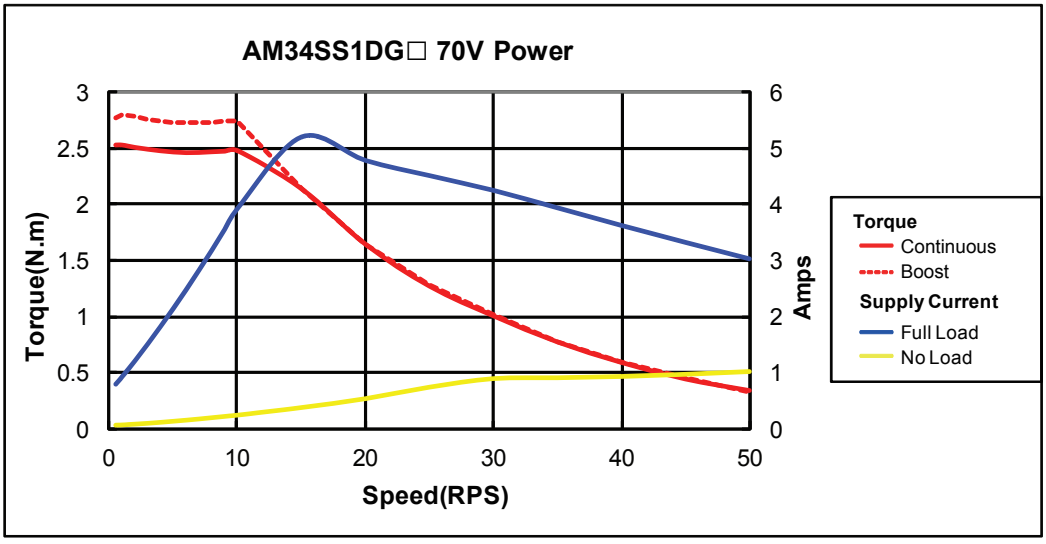

AM24SS3DG□ 24V Power
Torque(N.m)
Amps
Speed(RPS)
Torque
Continuous
Boost
Supply Current
Full Load
No Load

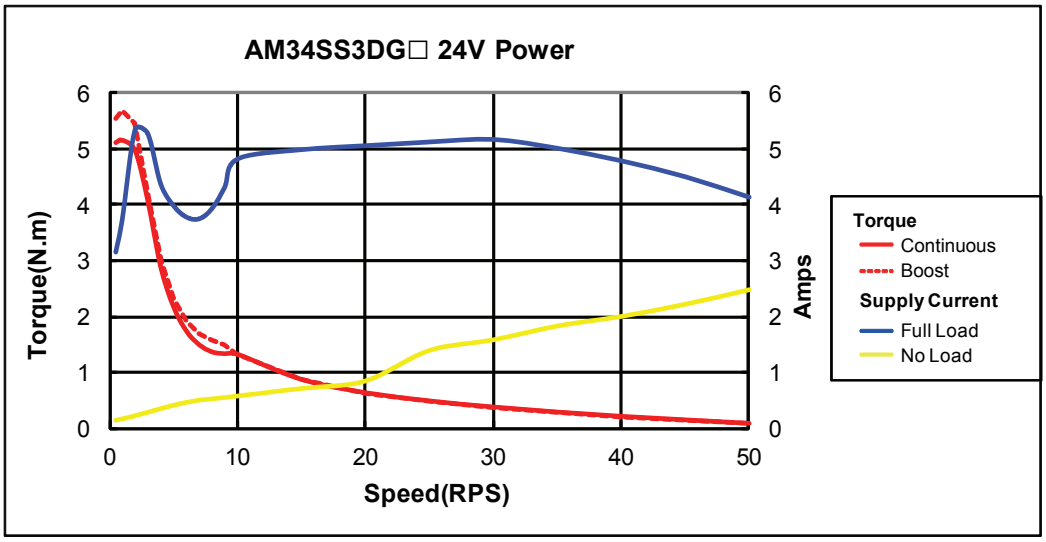

AM24SS3DG□ 48V Power
Torque(N.m)
Amps
Speed(RPS)
Torque
Continuous
Boost
Supply Current
Full Load
No Load

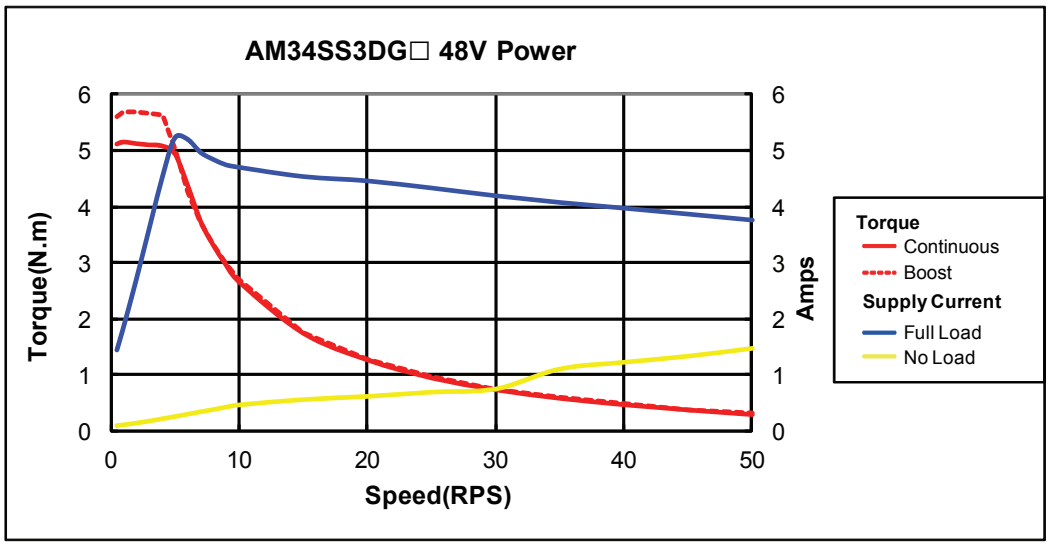

AM24SS3DG□ 70V Power
Torque(N.m)
Amps
Speed(RPS)
Torque
Continuous
Boost
Supply Current
Full Load
No Load

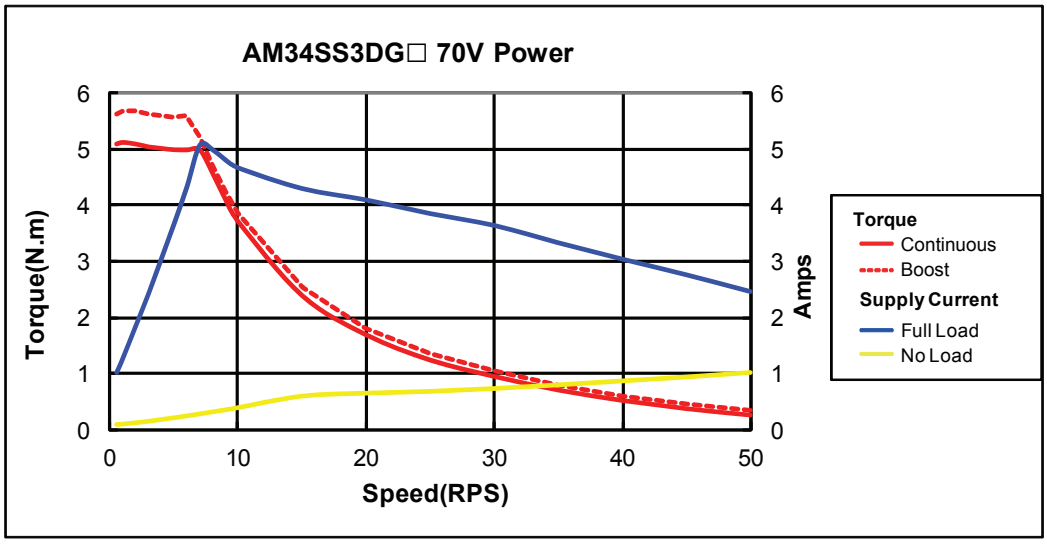

AM34SS1DG□ 24V Power
Torque(N.m)
Amps
Speed(RPS)
0
0.5
1
1.5
2
2.5
3
4
5
6
10
20
30
40
50
Torque
Continuous
Boost
Supply Current
Full Load
No Load

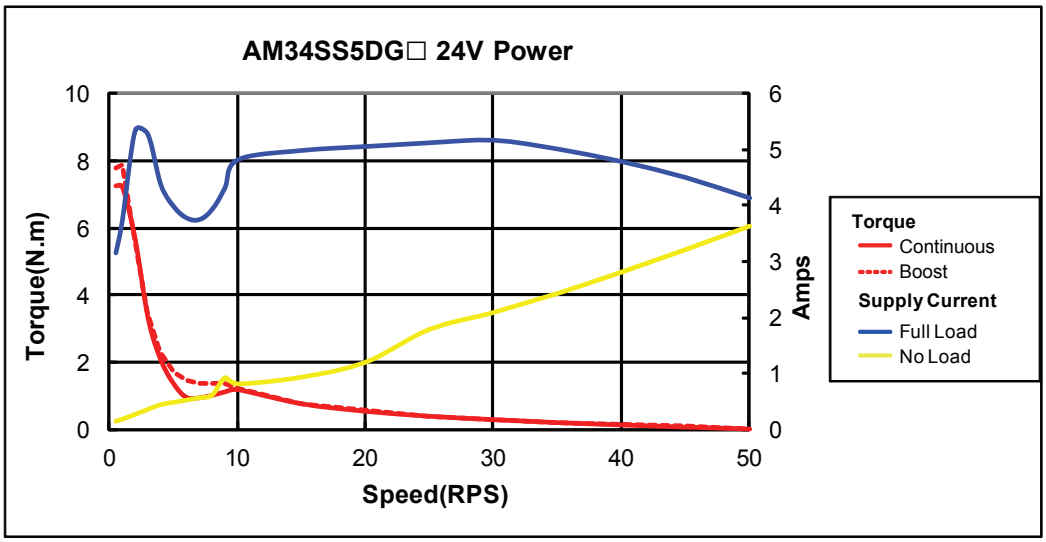

AM34SS1DG□ 48V Power
Torque(N.m)
Amps
Speed(RPS)
0
0.5
1
1.5
2
2.5
3
4
5
6
10
20
30
40
50
Torque
Continuous
Boost
Supply Current
Full Load
No Load

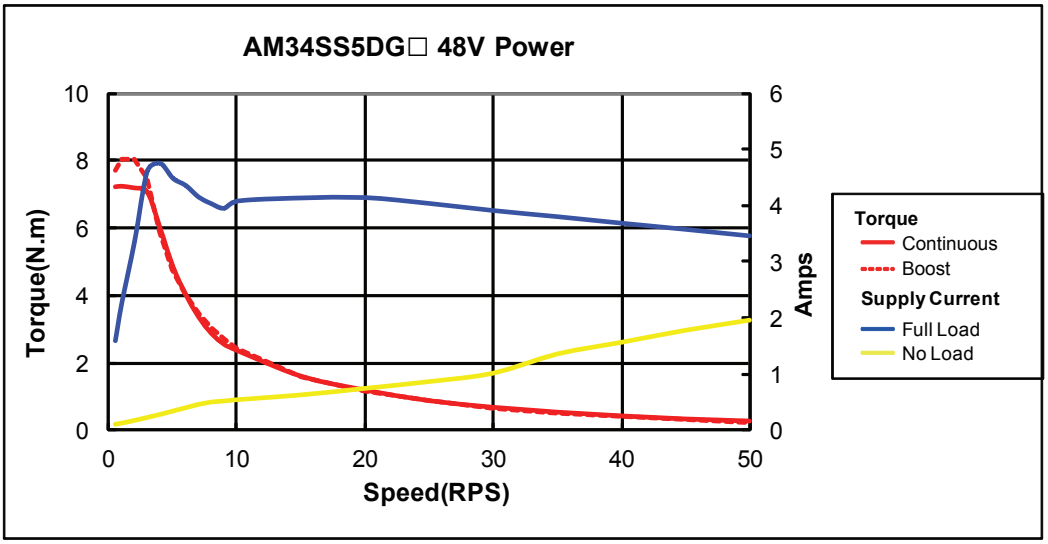

AM34SS1DG□ 70V Power
Torque(N.m)
Amps
Speed(RPS)
0
0.5
1
1.5
2
2.5
3
4
5
6
10
20
30
40
50
Torque
Continuous
Boost
Supply Current
Full Load
No Load

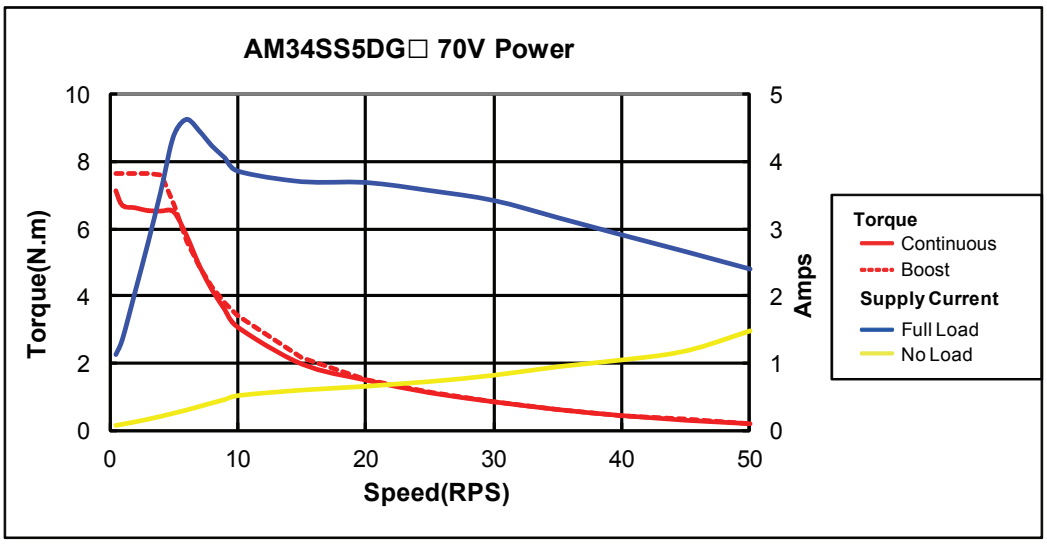

AM34SS3DG□ 24V Power
Torque(N.m)
Amps
Speed(RPS)
0
10
20
30
40
50
0
1
2
3
4
5
6
Torque
Continuous
Boost
Supply Current
Full Load
No Load


AM34SS3DG□ 48V Power
Torque(N.m)
Amps
Speed(RPS)
0
10
20
30
40
50
0
1
2
3
4
5
6
Torque
Continuous
Boost
Supply Current
Full Load
No Load


AM34SS3DG□ 70V Power
Torque(N.m)
Amps
Speed(RPS)
0
10
20
30
40
50
0
1
2
3
4
5
6
Torque
Continuous
Boost
Supply Current
Full Load
No Load


AM34SS5DG□ 24V Power
Torque(N.m)
Amps
Speed(RPS)
0
2
4
6
8
10
0
1
2
3
4
5
6
0
10
20
30
40
50
Torque
Continuous
Boost
Supply Current
Full Load
No Load

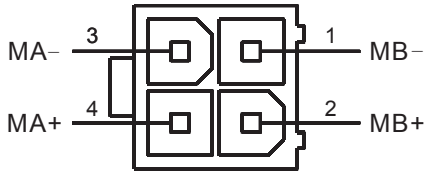

AM34SS5DG□ 48V Power
Torque(N.m)
Amps
Speed(RPS)
0
2
4
6
8
10
0
1
2
3
4
5
6
0
10
20
30
40
50
Torque
Continuous
Boost
Supply Current
Full Load
No Load


AM34SS5DG□ 70V Power
Torque(N.m)
Amps
Speed(RPS)
0
2
4
6
8
10
0
1
2
3
4
5
0
10
20
30
40
50
Torque
Continuous
Boost
Supply Current
Full Load
No Load

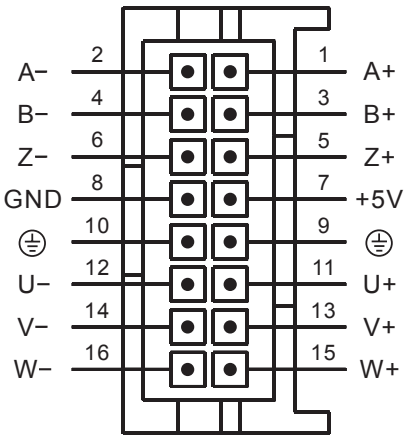
2.7 Connect to Motor

The SS motors have two cables. One is the motor power cable, the other one is the encoder feedback cable. Plug the motor power cable into the motor connector on the drive and plug the encoder feedback cable into the encoder feed back connector on the drive.

Do not damage or drag the cables on the motor.



Motor Connector

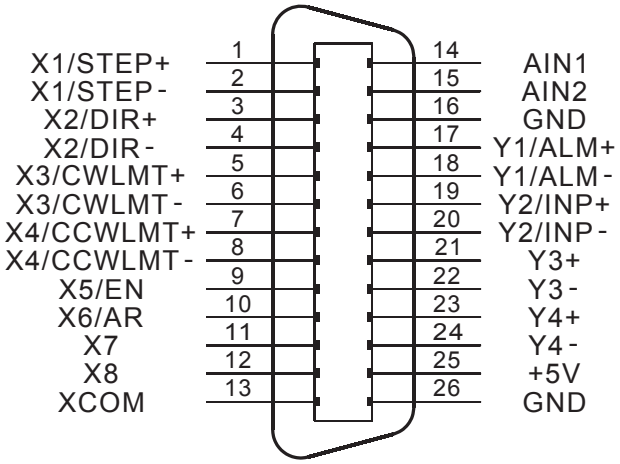


Encoder Feedback Connector

3 Inputs and Outputs

SS03/05/10-S/Q/C inputs and outputs include:

- 8 optically isolated digital inputs,5 - 24VDC logic
- 4 optically isolated digital outputs, maximum 30/100mA output
- 2 analog signal inputs,the range of input voltage can be set to 0-5V,0-10V, ±5V or ±10V



I/O Connector Diagram

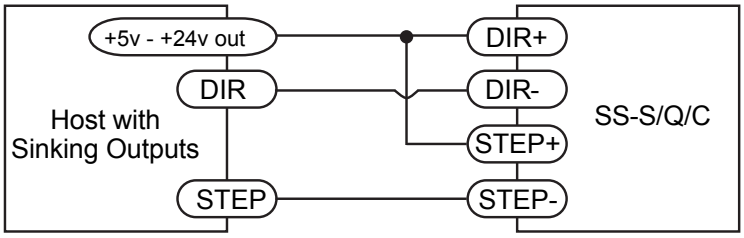
3.1 Digital Inputs

3.1.1 X1/STEP and X2/DIR High Speed Digital Inputs

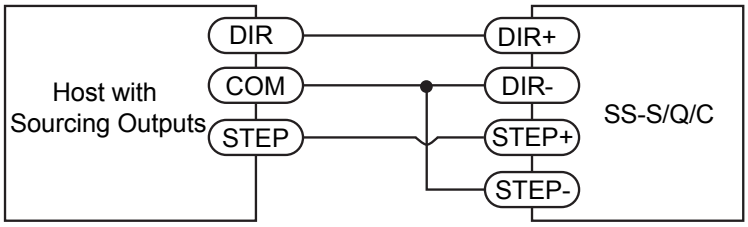
X1/STEP and X2/DIR are high-speed digital inputs operation 5-24V optical isolated single-ended or differential signal. The maximum input frequency is 2MHz.

- In Pulse and Direction mode, X1/STEP is pulse input,and X2/DIR is direction signal input.
- In CW/CCW mode, X1/STEP is CW pulse input,and X2/DIR is CCW pulse input.
- In A/B quadrature signal mode (Encoder follows), X1/STEP is signal A input, X2/DIR is signal B input.
- In velocity mode, X1/STEP can be set to RUN/STOP,X2/DIR is direction signal. X1 and X2 also can be configured as CW JOG and CCW JOG.
- In SCL mode, X1 and X2 can be configured as general purpose input for WI,OI,FS or SH and other commands.

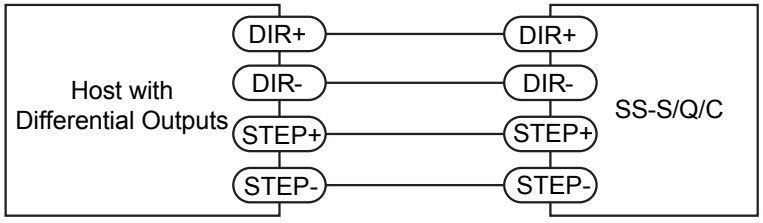
The diagrams below show how to connect the X1/STEP and X2/DIR to various commonly used devices.



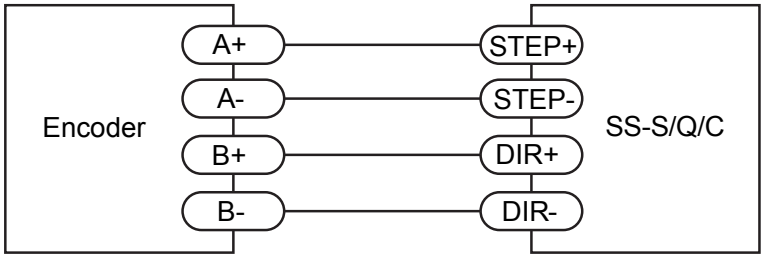
Connecting to Host with Sinking Outputs



Connecting to Host with Sourcing Outputs



Connecting to Host with Differential outputs



Connecting to An Encoder

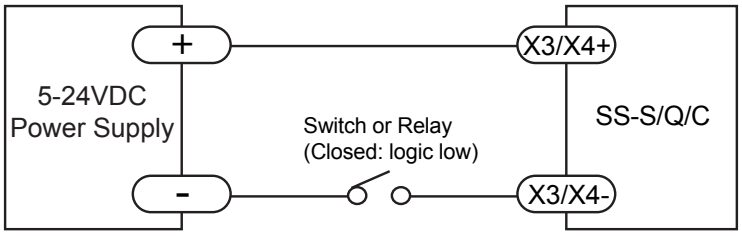
3.1.2 X3/CW LIMIT and X4/CCW LIMIT High-speed Digital Inputs

X3/CW LIMIT and X4/CCW LIMIT are high-speed digital inputs operation 5-24V optically isolated single-ended or differential signal. The maximum input frequency is 2MHz.

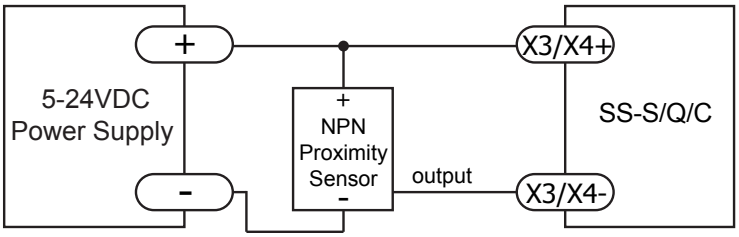
X3 can be configured as CW limit sensor input,and X4 can be configured as CCW limit sensor input.

NOTE:If current is flowing into or out of an input ,the logic state of that input is low or closed.
If no current is flowing ,or the input is not connected,the logic state is high or open.

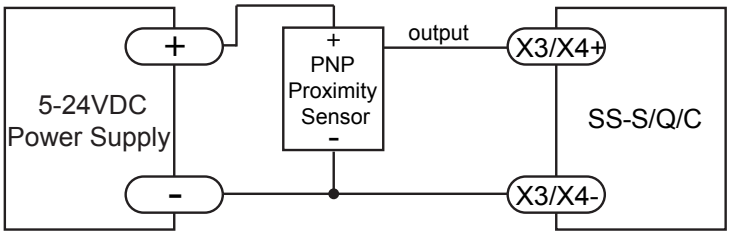
The diagrams below show how to connect to CW LIMIT and CCW LIMIT. Please select the polarity of the limit sensor by using the Step-servo Quick Tuner.



Connecting to a switch or relay



Connecting a NPN type Proximity Sensor to an Input
(when proximity sensor activates, output goes low)



Connecting a PNP type Proximity Sensot to an input
(when proximity sensor activates, output goes high)

3.1.3 X5/EN, X6/AR,X7 and X8 Digital Inputs

The X5/EN, X6/AR,X7 and X8 are digital inputs operation 5-24V optically isolated single-ended signal.

X5 can be configured as enable signal input to excite the motor ,and X6 can be configured as alarm reset signal input to clear the alarm and turns to the normal status as servo off.

In the velocity mode,X5 can also be configured as speed switch signal to change the speed to another one.

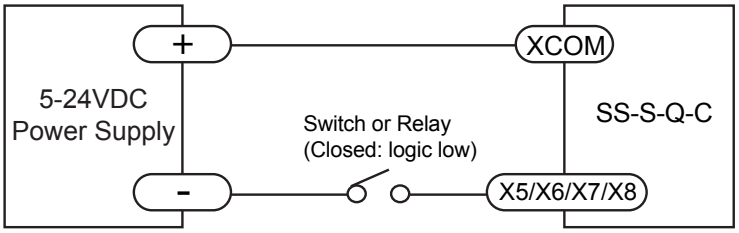
X7 and X8 can be configured as general purpose input for WI,OI,FS or SH and other commands.

Because the input is an optically isolated circuit, a 5-24V power supply is needed. For example, you can use the power supply of the PLC when you are using a PLC control system,but if you want to connect a relay or mechanical switch to the input ,you must need a power supply.

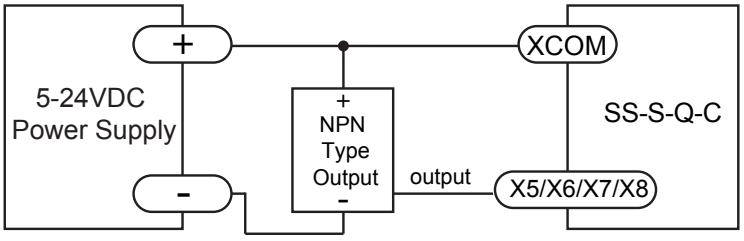
XCOM is an electronics term for an single-ended signal connection to a common voltage. In the case of SS series, if you are using a sourcing(PNP) input signals, you need to connect XCOM to the ground(power supply -),if you are using a sinking(NPN) input signals ,the XCOM need to connect to the power supply +.

NOTE: If current is flowing into or out of an input ,the logic state of that input is low or closed.
If no current is flowing ,or the input is not connected,the logic state is high or open.

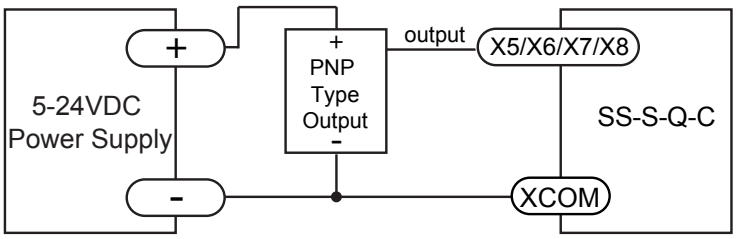
The chats below show how to connect to EN and AR. Please select the polarity of the inputs by using the Step-servo Quick Tuner.



Connecting to a Switch or Relay



Connecting a NPN type output to an Input



Connecting a PNP type output to an input

3.2 Digital Outputs

3.2.1 Y1/ALARM,Y2/IN POSITION,Y3 and Y4 Digital Outputs

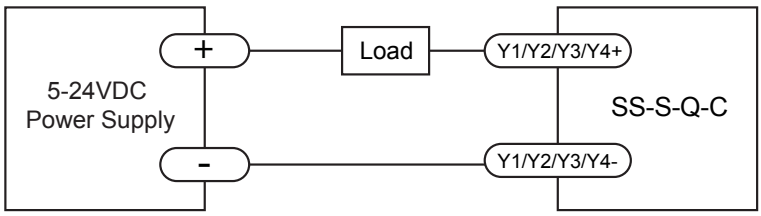
- Y1 can be configured as alarm signal output. It can also be configured as static in position signal output(static, checking in position when motor is stopped) ,or as dynamic in position signal output (dynamic, checking in position all the time.)
- Y2 can be configured as Tach signal output,tach output produce pulses relative to the motor position with configurable resolution. It can also be configured as static in position signal output(static, checking in position when motor is stopped) ,or as dynamic in position signal output (dynamic, checking in position all the time.),or as Timing signal output(50 pulses per rotation)
- Y3 can be configured as signal output to release brake. It can also be configured as static in position signal output(static, checking in position when motor is stopped) ,or as dynamic in position signal output (dynamic, checking in position all the time.)
- Y4 can be configured as static in position signal output(static, checking in position when motor is stopped) ,or as dynamic in position signal output (dynamic, checking in position all the time.)

Y1,Y2,Y3 and Y4 can be configured by Step-Servo Quick Tuner.

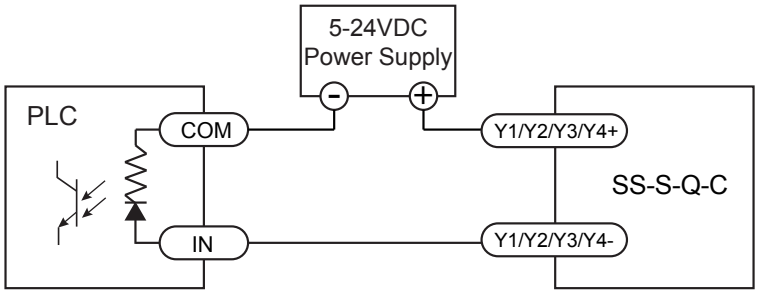
The chats below show how to connect to the output:

NOTE: Do not connect the outputs to more than 30VDC power supply.

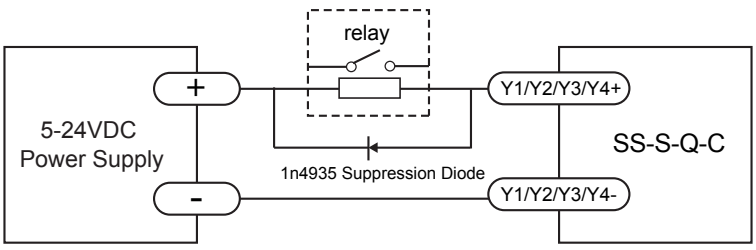
And the current of each output terminal must not exceed 100mA.



Connecting a Sinking Output



Connecting a Sourcing Output



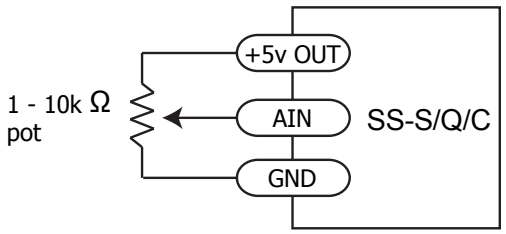
Driving a Relay

3.3 Analog Inputs

SS series drive has two analog signal inputs which can accept signal range of 0-5 Volts,0-10 volts ,±5V or±10Volts. The drive can be configured to operate at velocity mode or position mode that is proportional to the analog input.

Use the Step-Servo Quick Tuner to configure the input range,offset, deadband and noisy filter frequency.

SS series provides a +5V/100mA limit power supply that can be used to power external devices such as potentiometer. It is not the most accurate supply for reference,for more precise readings use an external supply that can provide the desired accuracy.



Connecting a Potentiometer to An Analog Input

4 Mounting the Drive

Use the M3 or M4 screw to mount the SS series drive .The drive should be securely fastened to a smooth ,flat metal surface the will help conduct heat away from the chassis. If this is not possible, forced airflow from a fan maybe required to prevent the drive from overheating.

- Never use the drive in a place where there is no air flow or the surrounding air is more than 40℃.
- Never put the drive where it can get wet or where metal or other electrically conductive particle particles can get on the circuity.
- Always provide air flow around the drive. When mounting multiple SS drives near each other, maintain at least 1.5cm of space between drives.

5 LED Display

SS series have two 7-segments LED,which is used to display operation mode ,error code ,bus address and communication baud rate.

LED1 is used to indicate operation mode and error code. When drive has no error ,LED1 is solid on to indicate operation mode. When drive has error,LED1 will flash at a 0.5 second rate to indicate error code. The dot point of LED1 is to indicate whether the drive is enabled. When the dot point is on ,the drive is enabled When the dot point is off,the drive is disabled.

5.1 Operation Mode

1. 2. 3. 4. 5. ...	1:CM1(Commanded Torque Mode) 2:CM2(Analog Torque Mode) 3:CM11~14(Analog Velocity Mode) 4:CM15~18(Velocity Mode) 5:CM10(Commanded Torque Mode) 6:CM7(Digital Position Mode) 7:CM21(Point to Point Mode) 8:CM22(Analog Position Mode)

5.2 Alarm Error Code

The faults of drive are shown in ***bold italics***. Motor will disable(Servo Off) when faults occur.

P	***Position Limit***
L.	CCW Limit
J.	CW Limit
t	***Over Temperature***
H	***Over Voltage***
U.	Under Voltage
b	***Internal Voltage***
C	***Over Current***
c.	Current Foldback
o	***Open Winding***
E	***Bad Encoder***
F.	Flash Memory Error
n.	NV Memory Error
-.	Communication Error
d	Move while Disabled
r	***Regen Failed***
1.2.3.4.5.6.7.8.	Q Program Running

LED2 is used to indicate bus address and communication baud rate.

Because the power-up serial communication baud rate is always 9600(BR=1). So after power up,LED2 flashes “1”to indicate the serial communication baud rate for 2 seconds. Then it will flashes the real operation baud rate(BR).

BR	Baud Rate(bps)
1	9600
2	19200
3	38400
4	57600
5	115200

About 6 seconds later,LED2 turns to solid to indicate the bus address for RS-485 or CANopen drive. SS-P/R drive always display “0”.

5.3 Assigning RS-485 Address

For the RS-485 drive,the dot point of LED2 indicates the communication address range is 0~15 when it is off. When the dot point of LED2 is on ,it indicates the communication address range is 16~31.

Low 4 bit(0~15) is set by the rotary switch. Use the Step-Servo Quick tuner to set the upper 1 bit (Axis 16-31). The RS-485 communication address can be set by the rotary and software on-line,LED2 will flash about 6 seconds to display the new bus address.

RS-485 Address and LED Display

LOW/HIGH Select	Rotary Switch	Address	LED Display
Low(Axis 0~ 15)	0	0	0
	1	1	1
	2	2	2
	3	3	3
	4	4	4
	5	5	5
	6	6	6
	7	7	7
	8	8	8
	9	9	9
	A	:	A
	B	;	b
	C	<	C
	D	=	d
	E	>	E
	F	?	F
High(Axis 16 ~ 31)	0	@	0.
	1	!	1.
	2	“	2.
	3	#	3.
	4	$	4.
	5	%	5.
	6	&	6.
	7	‘	7.
	8	(	8.
	9	)	9.
	A	*	A.
	B	+	b.
	C	,	C.
	D	-	d.
	E	.	E.
	F	/	F.

5.4 RS-485 Baud Rate and Terminating Resistor

There are five types of baud rate supported by RS-485 communication on SS drive. A terminating resistor (120 ohm) has already been installed inside of SS drive. To select/un-select the terminating resistor or communication baud rate setting can be selected by piano switch on SS drive:

BAUD RATE			
SW1	SW2	SW3	bps
OFF	OFF	OFF	9600
ON	OFF	OFF	19200
OFF	ON	OFF	38400
ON	ON	OFF	57600
OFF	OFF	ON	115200
ON	OFF	ON	Null
OFF	ON	ON	Null
ON	ON	ON	Null
TERMINATING RESISTOR			
SW4	OFF ON	Disconnected Connected	

5.5 Assigning CANopen Address

Each node on a CANopen network must have a unique Node ID. Valid ranges for the Node ID are 0x01 through 0x7F (1~127). Node ID 0x00 is reserved in accordance with CiA301. The Node ID is selected using rotary switches and software; one sixteen position switch set the lower four bits (0~F) of node ID, while upper three bits of node ID are configured by Step Servo Quick Tuner software. Each time when Node ID is changed, a power cycle is must before the new Node ID is valid.

Please refer to the CANopen manual for more information.

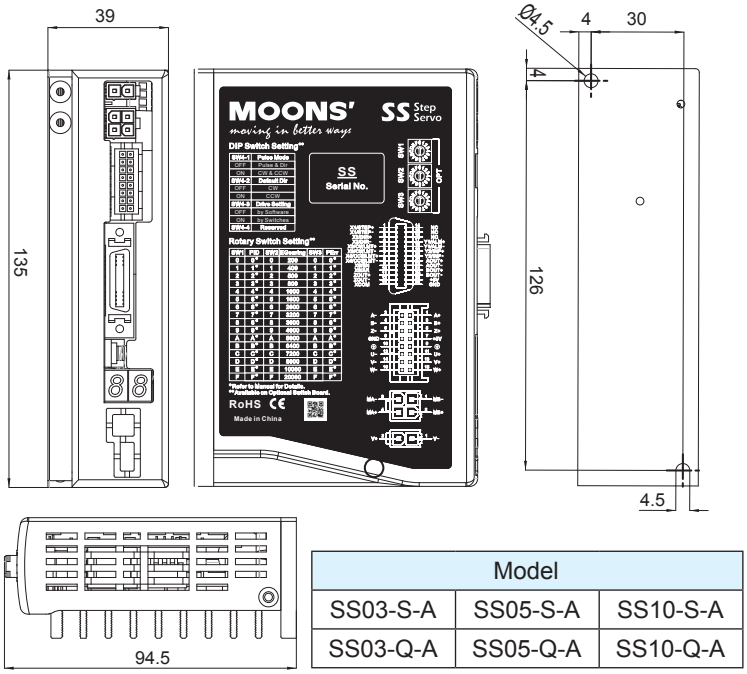
5.6 CANopen Baud Rate and Terminating Resistor

There are eight types of baud rate supported by CANopen communication on SS drive. A terminating resistor (120 ohm) has already been installed inside of SS drive. To select/un-select the terminating resistor or communication baud rate setting can be selected by piano switch on SS drive:

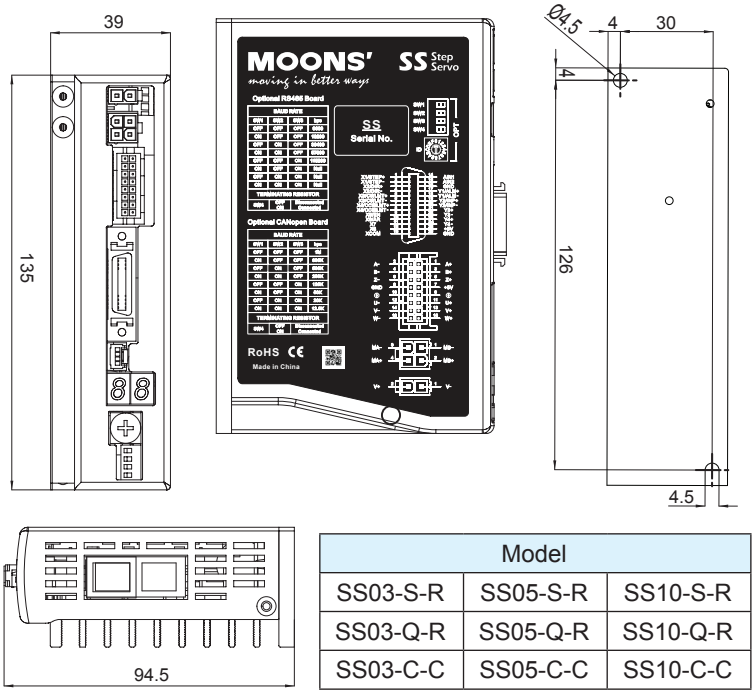
BAUD RATE			
SW1	SW2	SW3	bps
OFF	OFF	OFF	1M
ON	OFF	OFF	800K
OFF	ON	OFF	500K
ON	ON	OFF	250K
OFF	OFF	ON	125K
ON	OFF	ON	50K
OFF	ON	ON	25K
ON	ON	ON	12.5K
TERMINATING RESISTOR			
SW4	OFF ON	Disconnected Connected	

6 Reference Materials

6.1 Drive Mechanical Outlines



Model		
SS03-S-A	SS05-S-A	SS10-S-A
SS03-Q-A	SS05-Q-A	SS10-Q-A



Model		
SS03-S-R	SS05-S-R	SS10-S-R
SS03-Q-R	SS05-Q-R	SS10-Q-R
SS03-C-C	SS05-C-C	SS10-C-C

6.2 Technical Specifications

Power Amplifier	
Amplifier Type	Dual H-Bridge, 4 Quadrant
Current Control	4 state PWM at 20 KHz
Output Current	SS03 Maximum continuous current 3A, boost current 4.5A (for 1.5s) Drive auto-set the current limitation according to the attached motor
	SS05 Maximum continuous current 5A, boost current 7.5A (for 1.5s) Drive auto-set the current limitation according to the attached motor
	SS10 Maximum continuous current 10A, boost current 15A (for 1.5s) Drive auto-set the current limitation according to the attached motor
Power Supply	External nominal 24 - 75 volt DC power supply required Absolute maximum input voltage range 18 - 80 VDC
Protection	Over-voltage, under-voltage, over-temp, over-current
Controller	
Microstep Resolution	Software selectable from 200 to 51200 steps/rev in increments of 2 steps/rev
Encoder Resolution	20000 counts/rev for AM17/23/24/34SS motor;
	4096 counts/rev for AM11SS motor
Speed Range	Speeds up to 3600 rpm
Filters	Programmable hardware digital noise filter, software noise filter, smoothing filter, PID filter, notch filter
Non-Volatile Storage	Configurations are saved in FLASH memory on-board the DSP
Multiple Modes Of Control	Position mode (Step/Direction, CW/CCW pulse, A/B Quadrature pulse), Torque mode, Velocity mode, SCL mode, Q Programming, CANopen (as defined in CiA DSP402): Profile Position, Profile Velocity, Homing;
Digital Inputs	X1/STEP, X2/DIR, X3/CWLMT, X4/CCWLMT: Optical isolated, differential input, 5 - 24 volts, min. pulse width 250 ns. max. pulse fre¬quency 2 MHz X5/EN, X6/AR, X7, X8: Optical isolated, single-ended input, 5 - 24 volts
Digital Output	Y1/ALM, Y2/INP, Y3, Y4 Optical isolated, Open Collector, 30 volts, 100 mA max, maximum pulse frequency 10 KHz
Analog Input	AIN1, AIN2 Input resolution 12-bit, software configured as 0-5 volts, 0-10 volts, ±5 volts or ±10 volts (AIN referenced to GND)
+5V Supply Output	+4.8 - 5 volts @ 100mA maximum
Communication	RS-232, RS-485, CANopen
Environment	
Ambient Temperature	0 - 40°C (32 - 104°F) when mounted to a suitable heatsink
Humidity	90% non-condensing

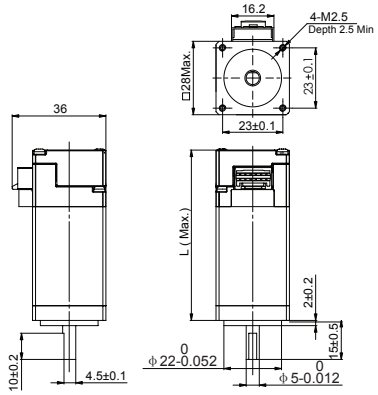
6.3 Recommended Motor

Motor Part Number	Frame Size	Holding Torque (N.m)	Matching Drive
AM11SS1DMA	28	0.05N·m	SS03- ■ - ◇
AM11SS2DMA		0.07N·m	
AM11SS3DMA		0.09N·m	
AM17SS1DG□	42	0.3N·m	SS05- ■ - ◇
AM17SS2DG□		0.5N·m	
AM17SS3DG□		0.6N·m	
AM17SS4DG□		0.75N·m	
AM23SS2DG□	56	0.9N·m	
AM23SS3DG□		1.5N·m	
AM24SS3DG□	60	2.5N·m	SS10- ■ - ◇
AM34SS1DGA	86	3.5N·m	
AM34SS3DGA		6.0N·m	
AM34SS5DGA		8.0N·m	

□: A or B, refer to motor part numbering system
■: R, P, S, Q, or C, refer to driver part numbering system
◇: A, R or C, refer to driver part numbering system

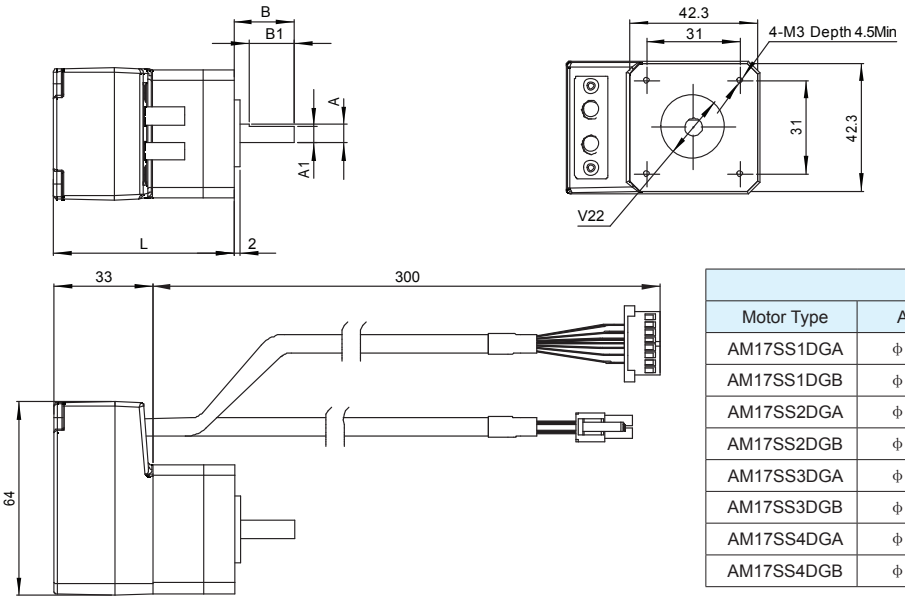
6.4 Motor Outlines

AM11SS



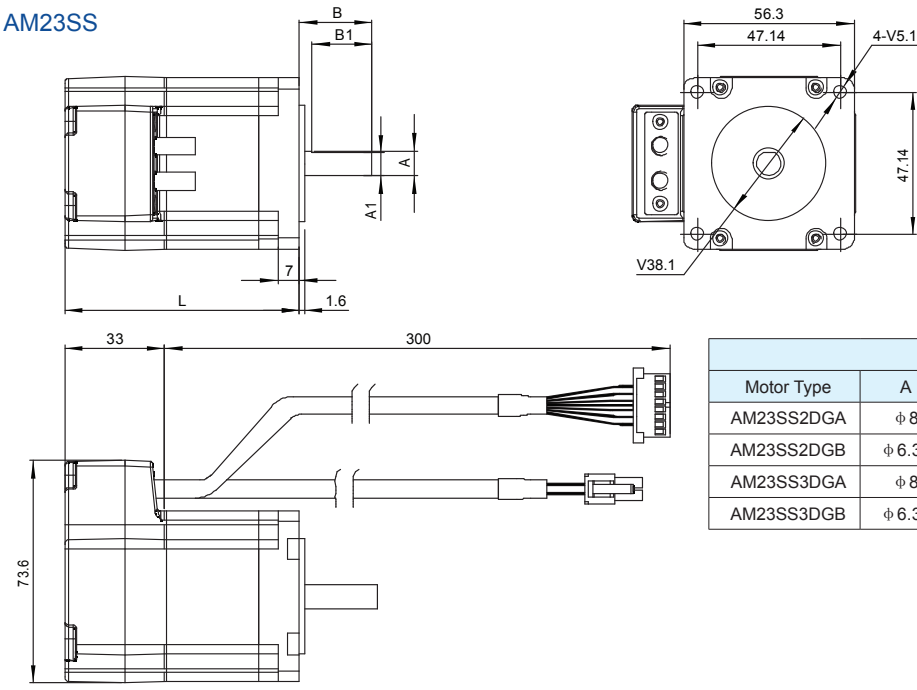
Motor Type	L
AM11SS1DMA	43.8
AM11SS2DMA	52.9
AM11SS3DMA	64.1

AM17SS



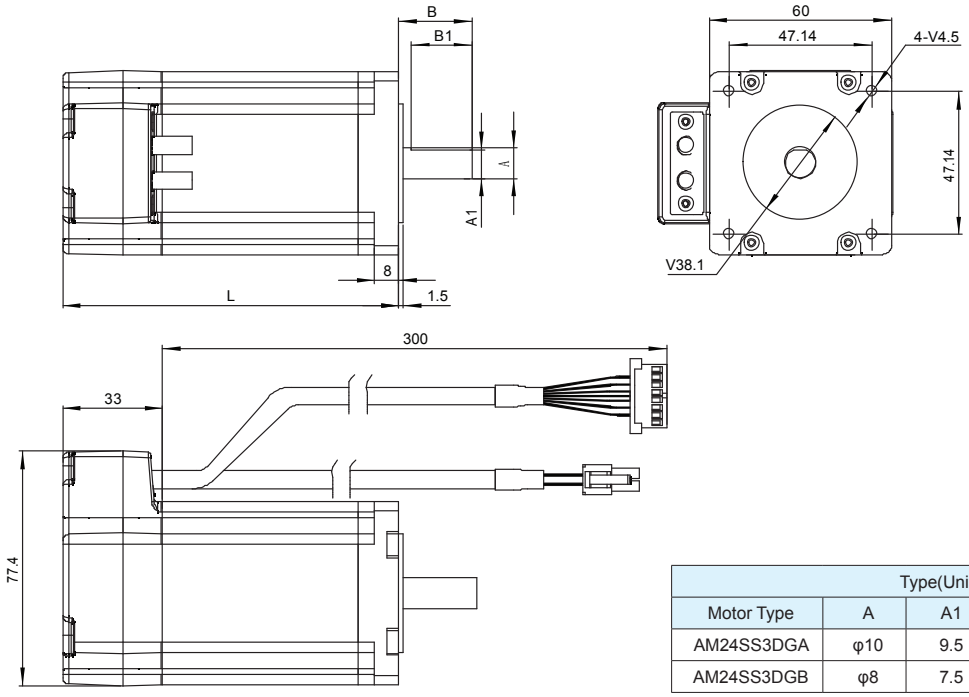
Type(Unit: mm)					
Motor Type	A	A1	B	B1	L
AM17SS1DGA	Φ6	5.5	20	15	59.5
AM17SS1DGB	Φ5	4.5	24	15	59.5
AM17SS2DGA	Φ6	5.5	20	15	65
AM17SS2DGB	Φ5	4.5	24	15	65
AM17SS3DGA	Φ6	5.5	20	15	73.5
AM17SS3DGB	Φ5	4.5	24	15	73.5
AM17SS4DGA	Φ6	5.5	20	15	89
AM17SS4DGB	Φ5	4.5	24	15	89

AM23SS



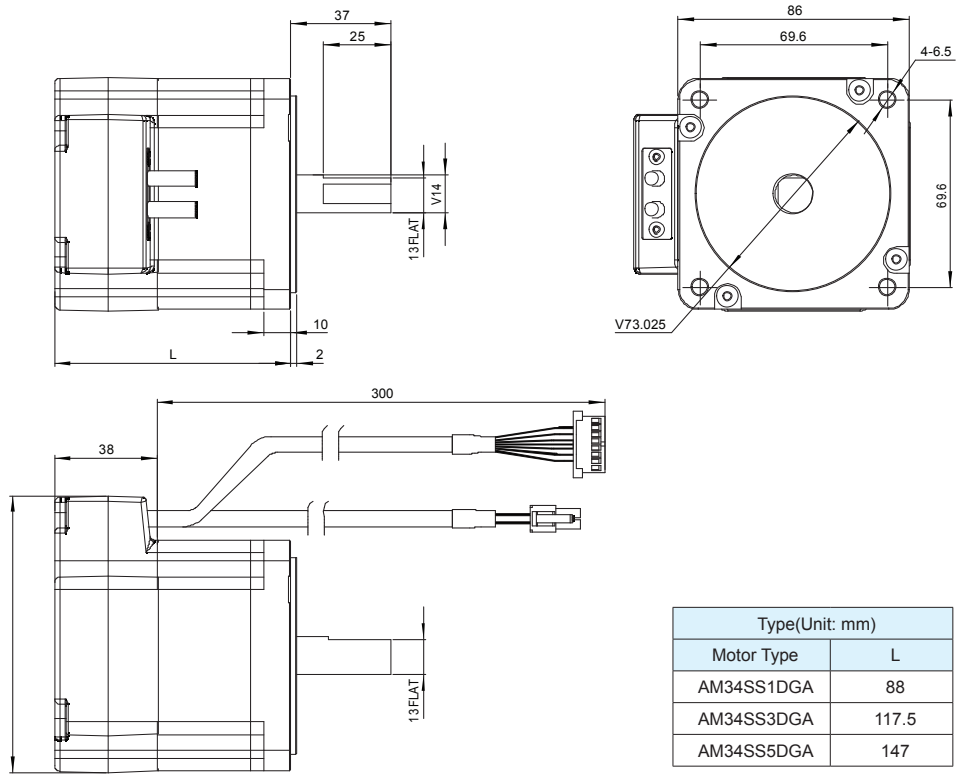
Type(Unit: mm)					
Motor Type	A	A1	B	B1	L
AM23SS2DGA	Φ8	7.5	24	20	77.5
AM23SS2DGB	Φ6.35	5.85	20	15	77.5
AM23SS3DGA	Φ8	7.5	24	20	99.5
AM23SS3DGB	Φ6.35	5.85	20	15	99.5

AM24SS



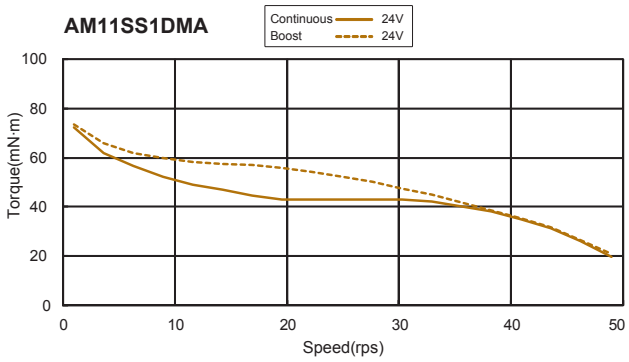
Type(Unit: mm)					
Motor Type	A	A1	B	B1	L
AM24SS3DGA	φ10	9.5	24	20	111
AM24SS3DGB	φ8	7.5	20	15	111

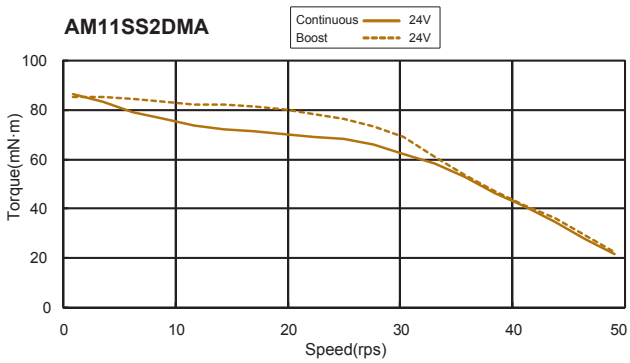
AM34SS

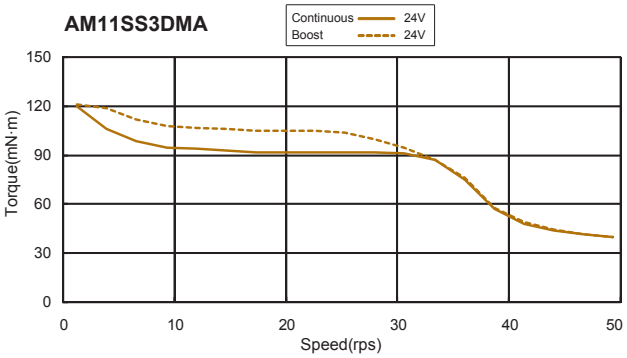


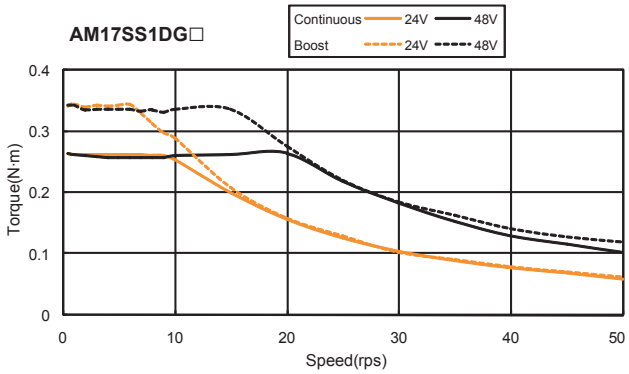
Type(Unit: mm)	
Motor Type	L
AM34SS1DGA	88
AM34SS3DGA	117.5
AM34SS5DGA	147

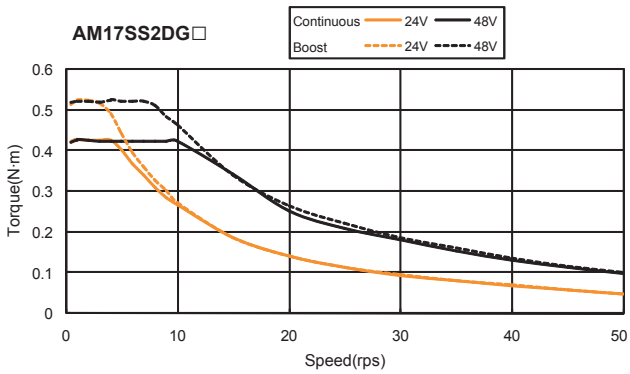
6.5 Torque Curves

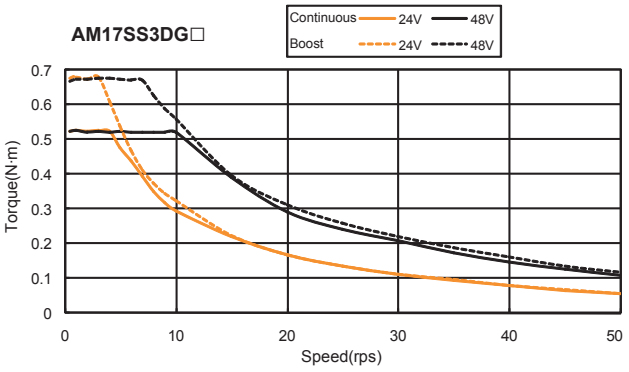


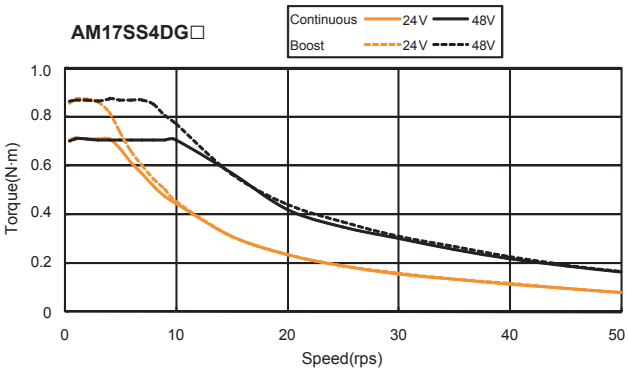


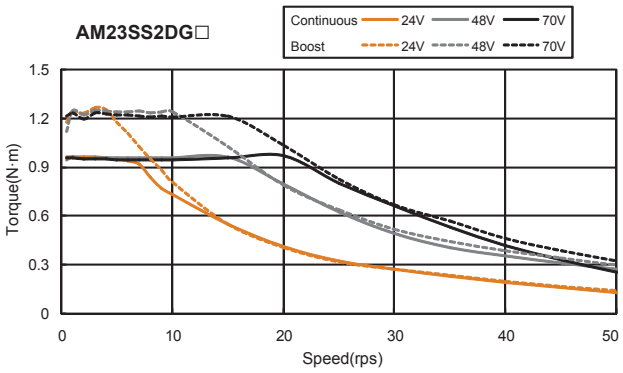


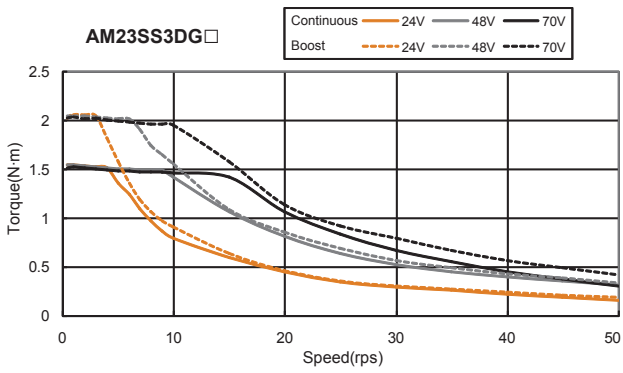


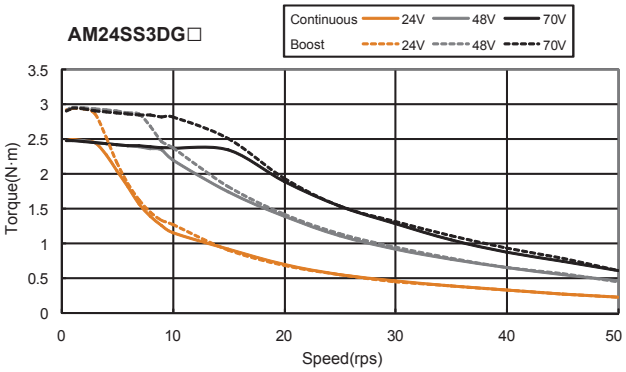


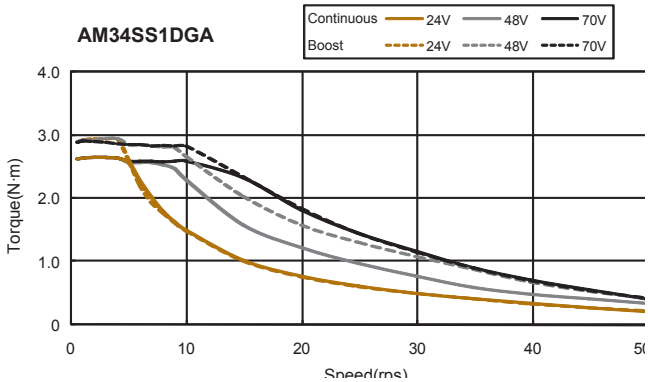


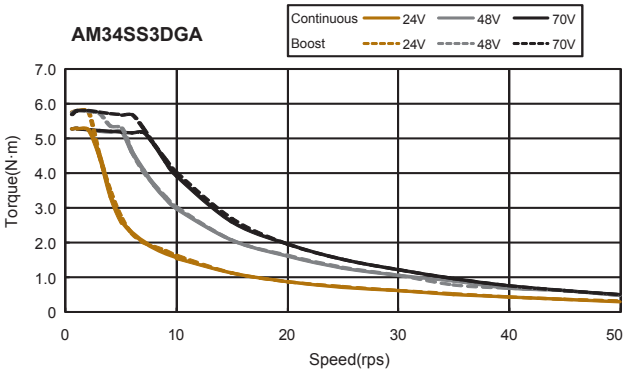


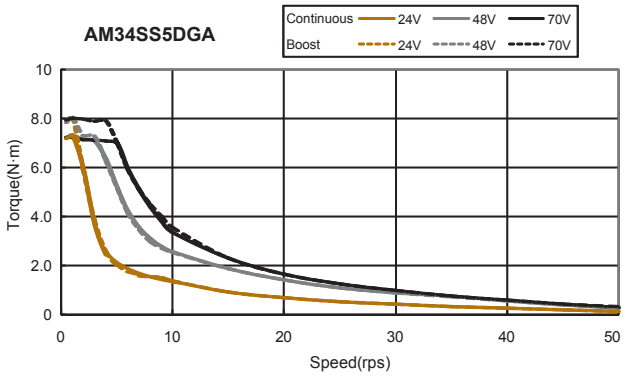

AM23SS2DG□
Continuous 24V 48V 70V
Boost 24V 48V 70V
Torque(N·m)
Speed(rps)


AM23SS3DG□
Continuous 24V 48V 70V
Boost 24V 48V 70V
Torque(N·m)
Speed(rps)

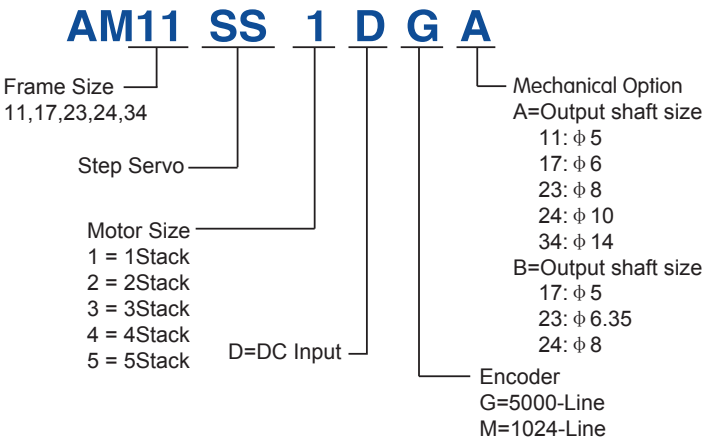

AM24SS3DG□
Continuous 24V 48V 70V
Boost 24V 48V 70V
Torque(N·m)
Speed(rps)


AM34SS1DGA
Continuous 24V 48V 70V
Boost 24V 48V 70V
Torque(N·m)
Speed(rps)

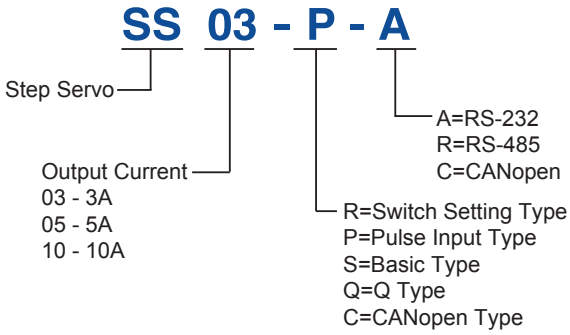

AM34SS3DGA
Continuous 24V 48V 70V
Boost 24V 48V 70V
Torque(N·m)
Speed(rps)


AM34SS5DGA
Continuous 24V 48V 70V
Boost 24V 48V 70V
Torque(N·m)
Speed(rps)

6.6 Motor Numbering System



6.7 Drive Numbering System



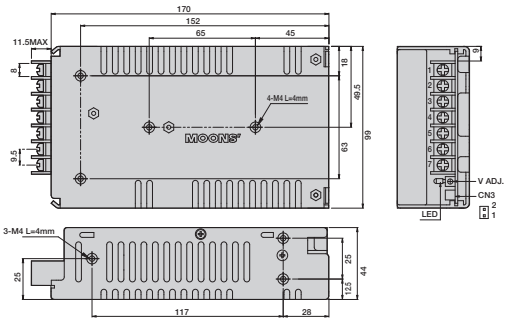
7 Optional Accessories (Sold separately)

P/N	Catagory	Technical Specification
MF150A24AG-V	Switching Power Supply	150W, 24V
MF320A48AG-V	Switching Power Supply	320W, 48V
2103-□□□	Cable	Motor Extension Cable for AM17/23/24/34SS motor
2109-□□□	Cable	Motor Extension Cable for AM11SS motor
2104-□□□	Cable	Encoder Extension Cable for AM17/23/24/34SS motor
2108-□□□	Cable	Encoder Extension Cable for AM11SS motor

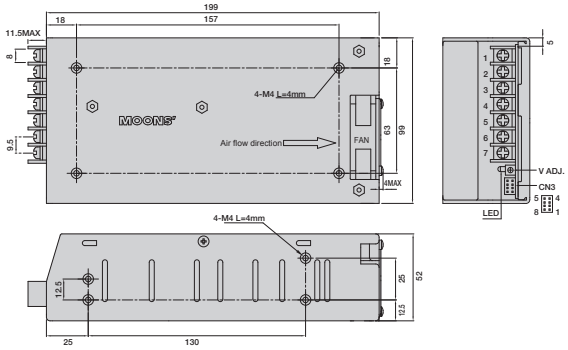
Switching Power Supplier

MOONS' recommend using following switching power supply.

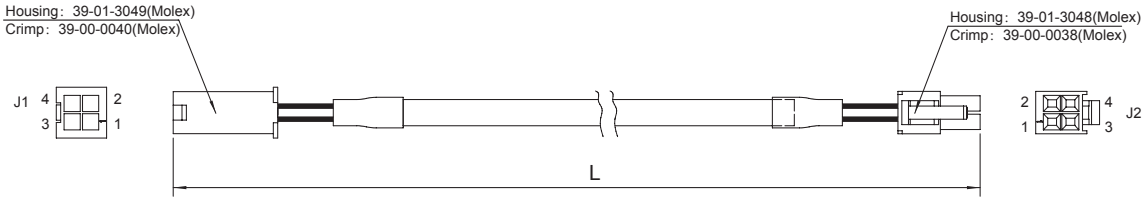
P/N:MF150A24AG-V 150W,24VDC



P/N:MF320A48AG-V 320W,48VDC



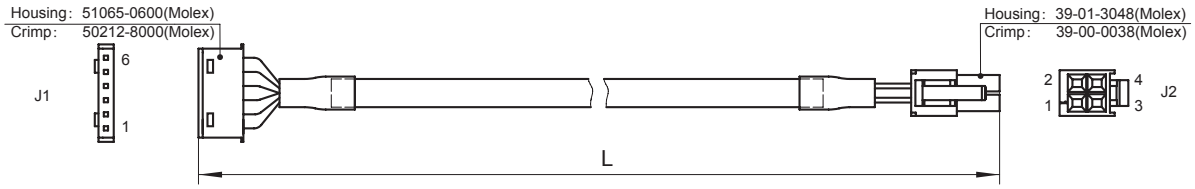
Motor Extension Cable for AM17/23/24/34SS motor



P/N	Length
2103-100	1M
2103-300	3M
2103-500	5M
2103-1000	10M

Wiring Diagram		
PIN（J1）	Colour(Signal)	PIN（J2）
1	Blue（B-）	1
2	Red（B+）	2
3	Green（A-）	3
4	Black（A+）	4

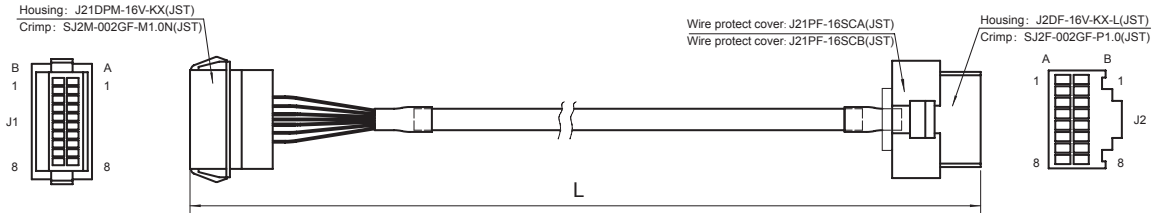
Motor Extension Cable for AM11SS motor



P/N	Length
2109-100	1M
2109-300	3M
2109-500	5M
2109-1000	10M

Wiring Diagram		
PIN（J1）	Colour(Signal)	PIN（J2）
1	Blue（B-）	1
3	Red（B+）	2
4	Green（A-）	3
6	Black（A+）	4

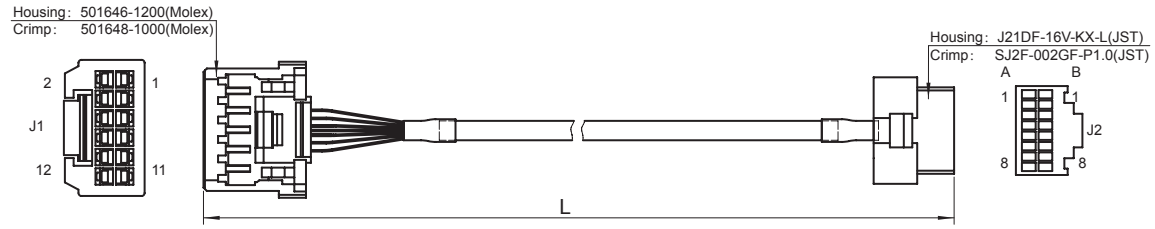
Encoder Extension Cable for AM17/23/24/34SS motor



P/N	Length
2104-100	1M
2104-300	3M
2104-500	5M
2104-1000	10M

Wiring Diagram		
PIN（J1）	Colour(Signal)	PIN（J2）
A8	Blue（A+）	A8
B8	Blue/Black（A-）	B8
A7	Green（B+）	A7
B7	Green/Black（B-）	B7
A6	Yellow（Z+）	A6
B6	Yellow/Black（Z-）	B6
A5	Red（+5V）	A5
B5	Black（GND）	B5
A3	Brown（U+）	A3
B3	Brown/Black（U-）	B3
A2	Gray（V+）	A2
B2	Gray/Black（V-）	B2
A1	White（W+）	A1
B1	White/Black（W-）	B1
B4	Shield	B4

Encoder Extension Cable for AM11SS motor



P/N	Length
2108-100	1M
2108-300	3M
2108-500	5M
2108-1000	10M

Wiring Diagram		
PIN（J1）	Colour(Signal)	PIN（J2）
10	Blue（A+）	A8
9	Blue/Black（A-）	B8
8	Green（B+）	A7
7	Green/Black（B-）	B7
6	Yellow（Z+）	A6
5	Yellow/Black（Z-）	B6
3	Red（+5V）	A5
4	Black（GND）	B5
	Brown（U+）	A3
	Brown/Black（U-）	B3
	Gray（V+）	A2
	Gray/Black（V-）	B2
1	White（W+）	A1
2	White/Black（W-）	B1
12	Shield	B4

8 Contacting MOONS'

Service Center
+86-400-820-9661

- **Headquarters**
  No. 168 Mingjia Road Industrial Park North Minhang District Shanghai 201107, P.R. China
  Tel: +86(0)21-52634688
  Fax: +86(0)21-62968682
  E-mail: info@moons.com.cn

- **MOONS' Industries (America), Inc.**
  1113 North Prospect Avenue,Itasca, IL 60143 U.S.A.
  Tel: 001-630-833-5940
  Fax: 001-630-833-5946

- **MOONS' Industries (Europe) S.r.l.**
  Via Torri Bianche n.1 20059 Vimercate(MB) Italy
  Tel: +39 039 62 60 521
  Fax: +39 039 96 31 409

- **MOONS' Industries (South-East Asia) Pte Ltd.**
  33 Ubi Avenue 3 #08-23 Vertex Singapore 408868
  Tel: +65 6634 1198
  Fax: +65 6634 1138

- **Shenzhen Branch Office**
  Room 2209, 22/F, Kerry Center,No. 2008 Renminnan Road Shenzhen 518001 P. R.China
  Tel: +86 (0)755 25472080
  Fax: +86 (0)755 25472081

- **Beijing Branch Office**
  Room 816, Block B, China Electronics Plaza,
  No. 3 Danling Street Haidian District Beijing,
  100080 P.R. China
  Tel: +86 (0)10-5875 3312
  Fax: +86 (0)10-5875 2279

- **Qingdao Branch Office**
  Room 10E, No.73 Wangjiao Mansion, mid. Hongkong Road Qingdao 266071 P. R.China
  Tel: +86 (0)532 85879625
  Fax: +86 (0)532 85879512

- **Wuhan Branch Office**
  Room 3001, World Trade Tower, No.686 Jiefang Avenue, Jianghan District, Wuhan 430022 P.R.China
  Tel: +86 (0)27-85448742
  Fax: +86 (0)27-85448355

- **Nanjing Branch Office**
  Room 302, Building A, Tengfei Creation Center,55 Jiangjun Avenue, Jiangning District,Nanjing 211100 P. R.China
  Tel: +86 (0)25 52785841
  Fax: +86 (0)25 52785485

- **Chengdu Branch Office**
  Room 1917, Western Tower, No.19,4th Section of South People Road,Wuhou District,Chengdu 610041
  P.R.China
  Tel: +86 (0)28-85268102
  Fax: +86 (0)28-85268103

- **Xi'an Branch Office**
  Room 1006, Block D, Wangzuo International City, No.1 Tangyan Road, Xi'an 710065 P.R. China
  Tel: +86 (0)29 81870400
  Fax: +86 (0)29 81870340

- **Ningbo Branch Office**
  Room 309, Block B, Taifu Plaza,No. 565 Jiangjia Road Jiangdong District Ningbo, 315040 P.R. China
  Tel: +86 (0) 574-8705 2739
  Fax: +86 (0) 574-8705 2365